TOOL & DIE JOURNAL

MAGAZINE OF

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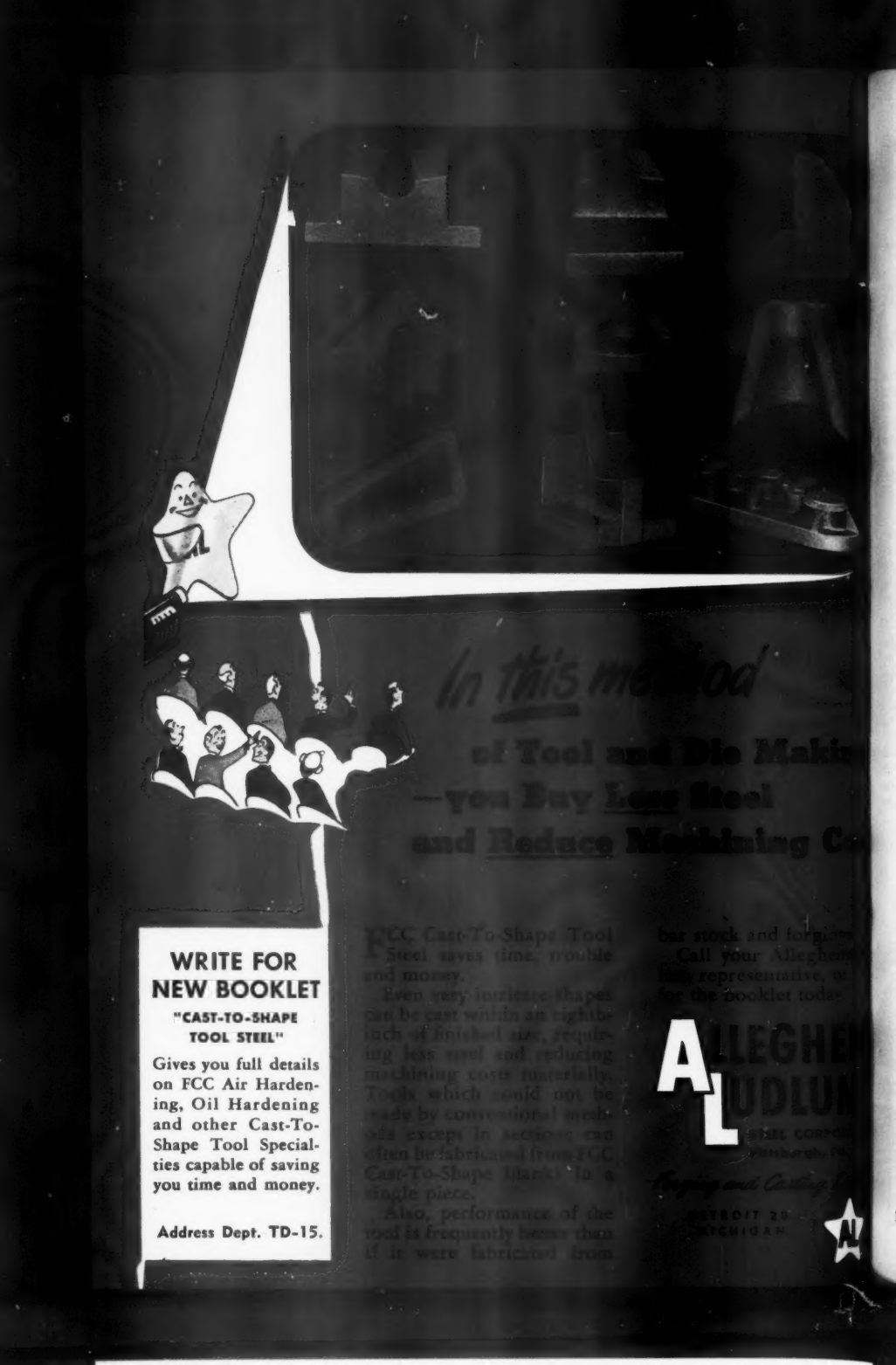
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FCC Cast-To-Shape Tool Steel saves time, trouble and money.
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The Only AIR CYLINDER with all controls Built-In!

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Bellows Air Motors are made in five bore sizes: 1¼", 1¾", 2½", 3⅜", 4½", and in any stroke length.

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All Bellows Air Motors are available with either the built-in electrically controlled Electro-aire® Valve or manually controlled valve, and in a wide range of mounting styles. Model shown is equipped with the Electroaire Valve.

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The Bellows Air Motor combines in one compact, complete power unit: double-acting air cylinder, four-way electrically-controlled directional valve, and speed regulating valves.

Instant Action

No lag between the movement of the valve and the action of the piston.

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Piston rod speed in either or both directions can be precisely regulated, *with no power loss.*

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Streamlined, space-saving, design fits into crowded quarters or on moving machine elements.

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Installation is quicker . . . easier. The *one* air connection needed can be made with flexible air hose.

If you use air cylinders, you will save time, money, and space with the Bellows Air Motor — the only air cylinder with all controls built in.

Write for New Bulletin CL-30

Specifications, wiring diagrams, design and construction detail.

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AKRON 9, OHIO

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TOOL & DIE JOURNAL

MAGAZINE OF TOOLING AND PRODUCTION

1975 LEE ROAD
CLEVELAND 18, OHIO

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TOOL & DIE JOURNAL is published monthly for plant operating and purchasing executives and department heads in 50 types of end product manufacturing. The circulation is composed of tool, die, gage and precision machine shops, complete power unit, die-controlled direct-numerical control manufacturers, complete power unit, die-controlled direct-numerical control manufacturers, and others. Every copy is directed to such an individual by name, by title and by company. See ECA certification. These men, from whom emanate recommendations, requisitions and orders for tooling materials, tools, equipment and accessories, comprise the Cycles of Buying Influence within their respective plants. CBI—and it is their influence—TOOL & DIE JOURNAL'S ever-vital reader circulation.

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PUBLISHER'S MEMO:

EVER INCREASING PRODUCTIVITY

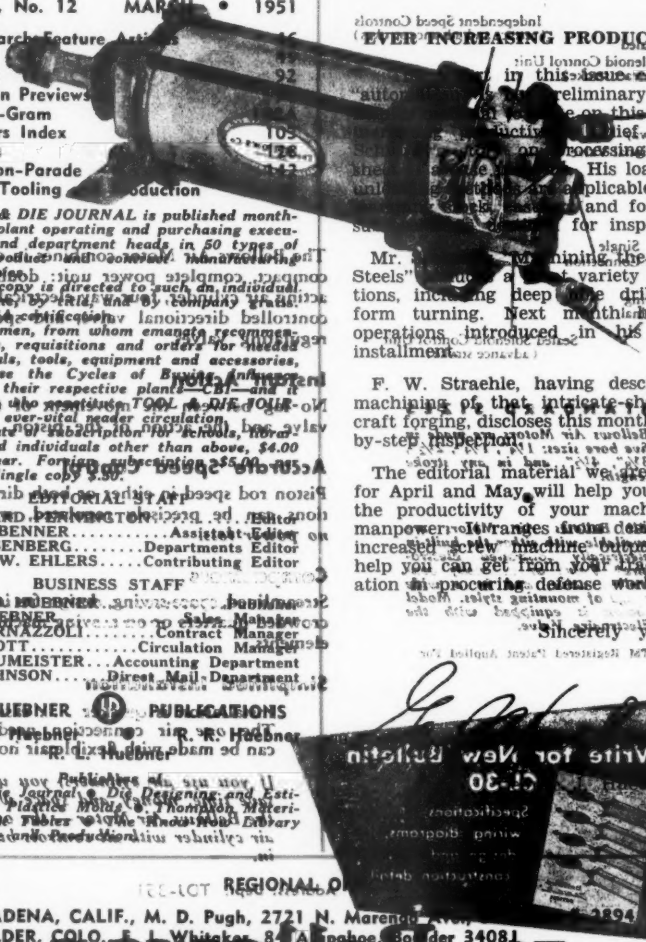
... in this issue concerning ... preliminary to much ... on this means of ... productivity ... Engineer ... processing, Formica ... His loading and ... applicable to metal ... and forgings, or ... for inspection.

Mr. ... machining the Stainless Steels" ... a great variety of operations, including deep hole drilling and form turning. Next month he details operations introduced in his January installment.

F. W. Straehle, having described the machining of that intricate-shaped aircraft forging, discloses this month its step-by-step inspection.

The editorial material we are readying for April and May will help you increase the productivity of your machines and manpower. It ranges from designing for increased screw machine tolerant, to the help you can get from your trade association in procuring defense work.

Sincerely yours,



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Fully-Formed Pressure Plugs

THE CINCINNATI SHAPER CO.

STEEL CO.

SYLVANIA

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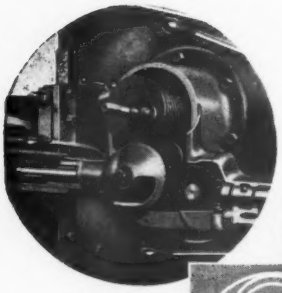
ACCURATE



Exclusive Cincinnati Feed Mechanism

Shaping internal keyways to close limits.

Tool has cut seven inches, and ram has not moved beyond bearing support.

ACCURATE FEEDING

No bumps, no gaps in the feed on a Cincinnati Shaper. The unique feed mechanism, with a cam for each feed always in contact with the follower, maintains both accuracy and a superior finish to the work.

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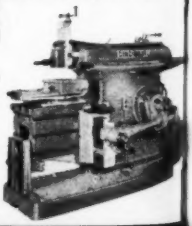
To further increase accuracy, a Cincinnati Shaper literally hugs the work. Extended ram bearings and full table clearance keep the work close to the column, reduce vibration and deflection, and consequent inaccuracies. A Cincinnati Shaper is the closest coupled shaper in the field.

For dependable, day in, day out accuracy, investigate a Cincinnati.



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SHAPERS · SHEARS · BRAKES

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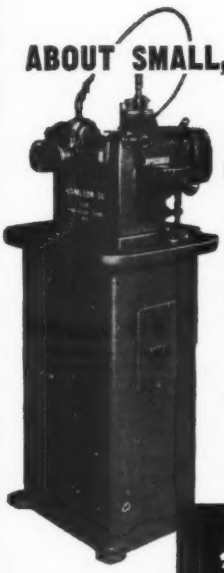
THE MOST NEWS
and
THE BEST NEWS

ABOUT SMALL, PRECISION SPUR GEAR HOBBING

IS YOURS
FOR A MINUTE AND A PENNY



Does your job involve small, precision spur gears? Would you like to produce them fast?

Whether your work calls for long production runs or frequent set-ups, you need to know about the Hamilton No. 00 Precision Spur Gear Hobber. Spend a minute now to send your request for a copy of our Bulletin No. H-00-49. Acquaint yourself with this efficient tool, and be ready for the challenge ahead.

NOTE: If you are interested in helical gears, worm gears, bevel gears, and crown gears, as well as spur gears, ask for Bulletin H I-49. No obligation.

THE *Hamilton* TOOL COMPANY

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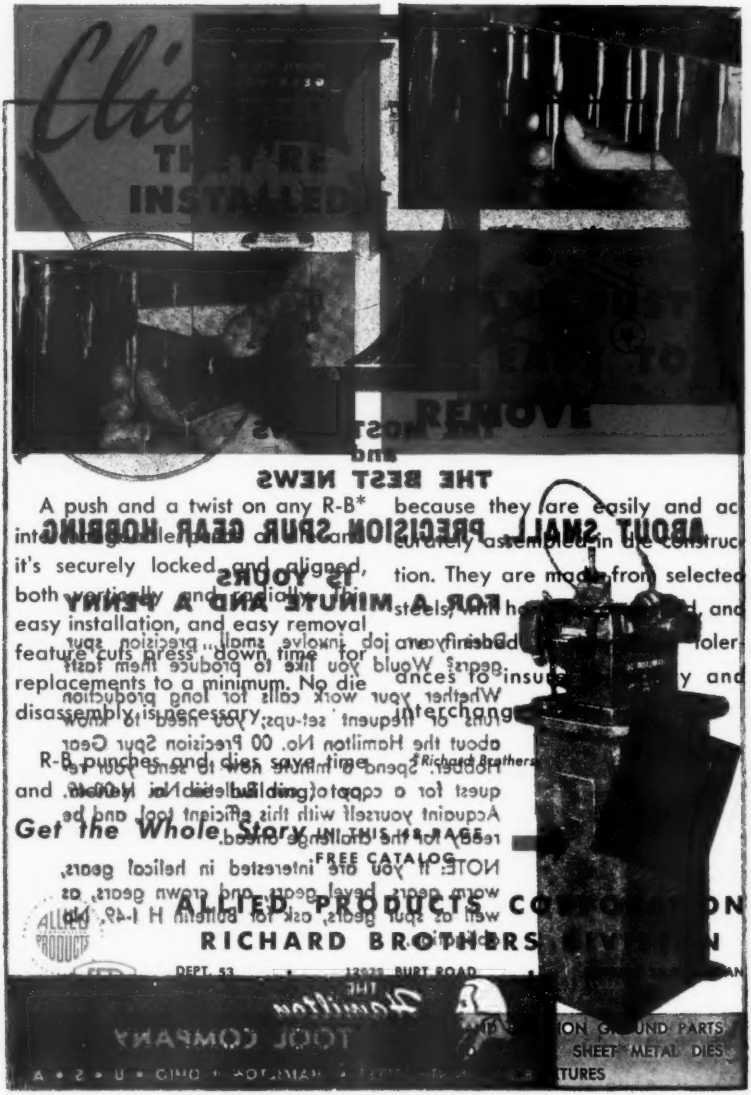
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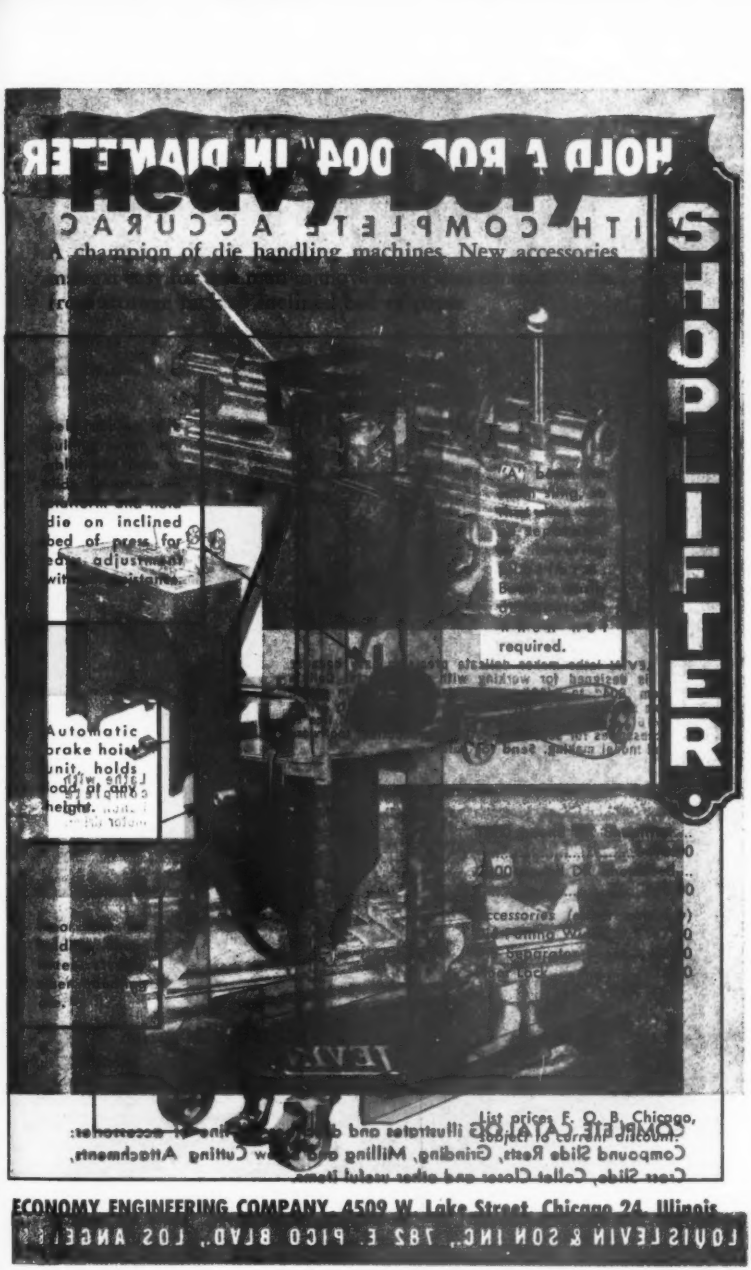
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die on inclined
bed of press for
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Automatic
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load at any
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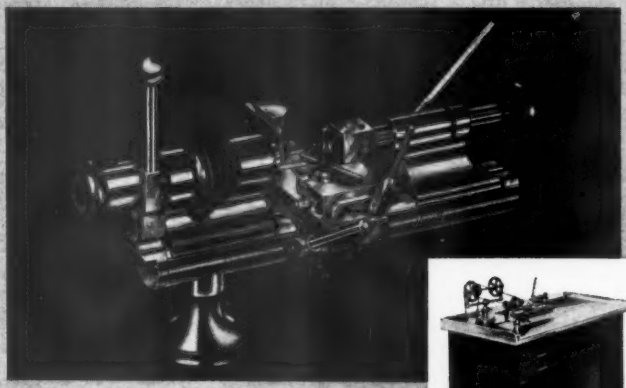
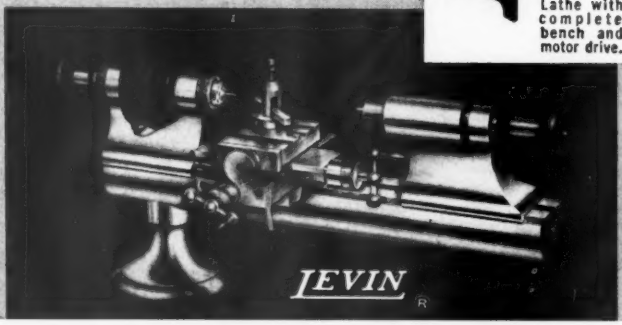
HOLD A ROD .004" IN DIAMETER

WITH COMPLETE ACCURACY



A LEVIN lathe makes delicate precision easy because it is designed for working with small parts. Collets from .004" to 5/16" are standard and kept in stock. Two sizes of lathes with maximum collet capacity either 3/16" or 5/16", swing 4", bed length 12". Full line of accessories for second operations, production, tool work and model making. Send for catalog.

Lathe with complete bench and motor drive.



COMPLETE CATALOG illustrates and describes full line of accessories: Compound Slide Rests, Grinding, Milling and Screw Cutting Attachments, Cross Slide, Collet Closer and other useful items.

LOUIS LEVIN & SON INC., 782 E. PICO BLVD., LOS ANGELES

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HOLES PER GRIND *increased from 8 to 83!*

The *Right* CLE-FORGE stock drill gives spectacular performance

A farm implement manufacturer had trouble drilling small, deep holes in a 1019 steel shaft. Regular drills burned on the corners and gave only 3 to 8 holes per grind. When a *Cleveland* Service Representative was called in, he recommended the special purpose CLE-FORGE High Speed Drill, a stock item, illustrated here. Speed and feed remained the same. The CLE-FORGE High Speed Drills averages *ten times more* holes per grind! There are several special purpose CLE-FORGE High Speed Drills, regularly stocked by your Distributor, which often can help you solve a difficult drilling problem. A *Cleveland* Service Representative will be glad to advise you. Contact our nearest Stockroom, or . . .

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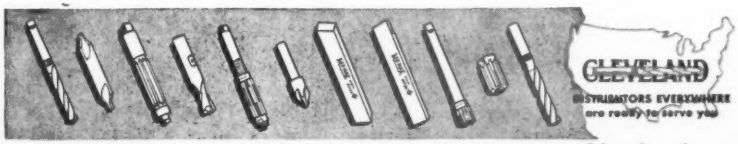

ASK YOUR INDUSTRIAL SUPPLY DISTRIBUTOR FOR THESE AND OTHER *Cleveland* TOOLS

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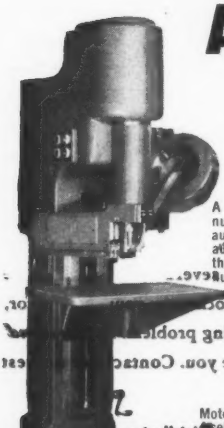
INDUSTRIAL SPEED-UP

demands

these POWER-DRIVEN

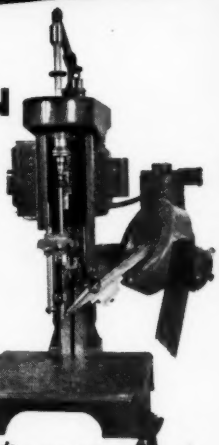
PRODUCTION AIDS . . .

Now, more than ever, speed in production is the order of the day . . . That's why these popular D.P.S. power-driven machines prove a greater-than-ever contribution to present-day industrial needs.



NUT DRIVER

A revolutionary new machine that drives nuts with amazing speed. Either semi- or automatically, or it can be adapted to full automatic operation entirely eliminating the manual handling of nuts. Capacity:



POWER SCREWDRIVER

Model A

Detroit Power Screwdrivers are hopper-fed and furnished in three models to drive from No. 2 to ⅝" cap screws. Will drive all types screws, as fast as one a sec . . . All drive to uniform de . . . Will not strip threads or mar heads. Great time and labor-saving machines that boost production assembling and bring labor costs down.

HOPPER UNIT

Motorized—Highly Adaptable—Selective feeding device where by production parts are selected, oriented and fed in a given position for primary and sec-

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Yes, send along your new catalog . . . without obligation.

COMPANY NAME

STREET ADDRESS

CITY STATE

SEND SAMPLE PART FOR PRODUCTION

DETROIT POWER SCREWDRIVER

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proved in more than 10,000 shops...

. . . faster, easier driving with
firm finger grip on the knurled heads—
spin in with hexagon wrench.

DANLY TOOL, DIE AND GAGE

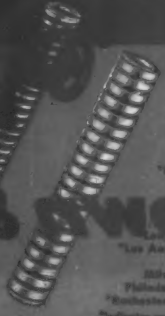
assure tool and die makers of stan
part quality fully consistent
good tool making practice. The Danl
includes many items in ad
those shown, such as
bushings,
A n

BUILD BETTER DIES WITH

DANLY

ID GAGE MAKER'S SUPPLIES

PRECISION DIE SETS . . . STANDARD AND SPECIAL



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Milwaukee 2, 111 East Wisconsin Avenue
Philadelphia 44, 18 West Chelten Avenue
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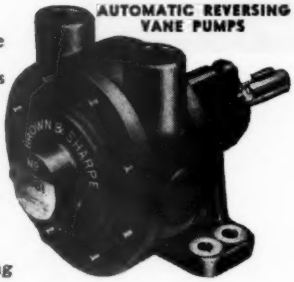
5 steps of progressive design!

During 1950, Brown & Sharpe has announced the 5 new developments in machine tools and equipment shown here. This is typical of the major contributions which this company is constantly making to faster, lower-cost, more-accurate production for metal working plants.

When you specify machine tools and equipment backed by such progressive engineering design, you are taking the soundest way to insure bigger returns on your investment . . . higher productivity for operators and machines . . . longer accurate life for machines and equipment.

Write for details on any of the new products illustrated here.
Brown & Sharpe Mfg. Co., Providence 1, R. I., U.S.A.



AUTOMATIC REVERSING VANE PUMPS

NO. 10N CUTTER & TOOL GRINDING MACHINE

Brown & Sharpe

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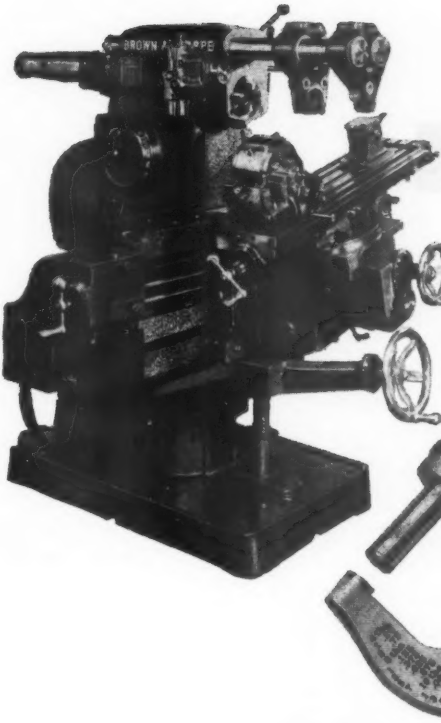

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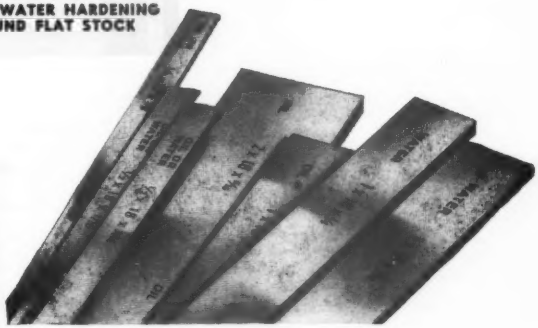
COMPLETELY NEW LINE OF MICROMETERS

OIL OR WATER HARDENING GROUND FLAT STOCK



B·S

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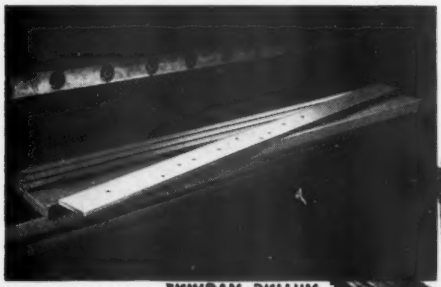
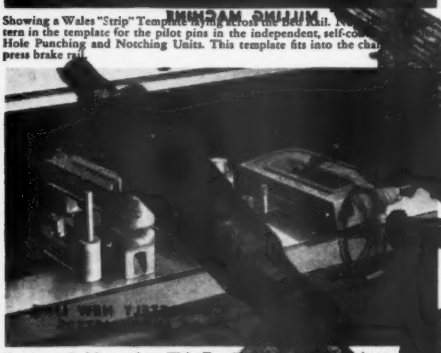


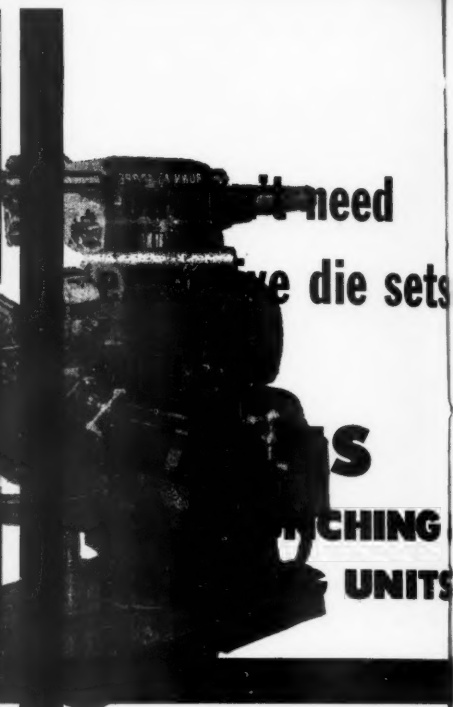
Showing a Wales "Strip" Template ... tern in the template for the pilot pins in the independent, self-co... Hole Punching and Notching Units. This template fits into the cha... press brake rail.



Showing an End Stop and two Wales Type ... its set ... "Strip" Template in the Bed Rail. The t... bolted ...

A Typical hole punchi... ...era... die sets.

Illustration shows a combination set-up of Wales Type ... Hole Punching Units and Type "N" Notching Units with work in foreground.



...need

...e die sets

...S

...CHING

... UNITS

● The exclusive Wales "Strip" Template Mounting Method for press brakes provides faster set-ups, reduced press "down-time" and easier storage of templates,—all *without the use of die sets.*

As shown at the left, this Mounting Method is made in 2 parts — (1) the Bed Rail and (2) the "Strip" Templates that fit into the bed rail channel. In this way, the Bed Rail remains in the press and ... Templates are interchanged for unlimited set-ups.

The hole locations are drilled and reamed in the "Strip" Templates for the pilot pins that are concentric with the punches and dies in all Wales independent, self-contained Units. In many cases, holes for several set-ups may be drilled in one "Strip" Template. The press ram does not have to be adjusted between set-ups due to the uniform shut height of Wales Hole Punching and Notching Units. In addition, the same group of Units may be used on an unlimited number ... "Strip" Templates.

THE MULTIPLE SAVINGS IN TIME AND ...ESTMENT with Wales Equipment is too BIG a ... tell in this space, so write for fully-illustrated, ...lly-colored Catalog BL and Catalog N *today.*

WALES-STRIPPIT CORPORATION

GEORGE F. WALES, *Chairman*

335 PAYNE AVE., NORTH TONAWANDA, N. Y.

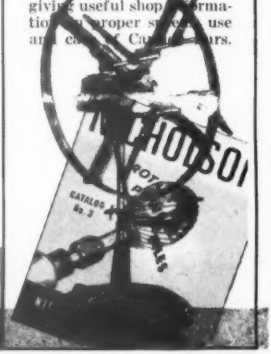
(Between Buffalo and Niagara Falls)

WALES-STRIPPIT OF CANADA, LTD., HAMILTON, ONTARIO

Specialists in Punching and Notching Equipment

Free Instruction Catalog

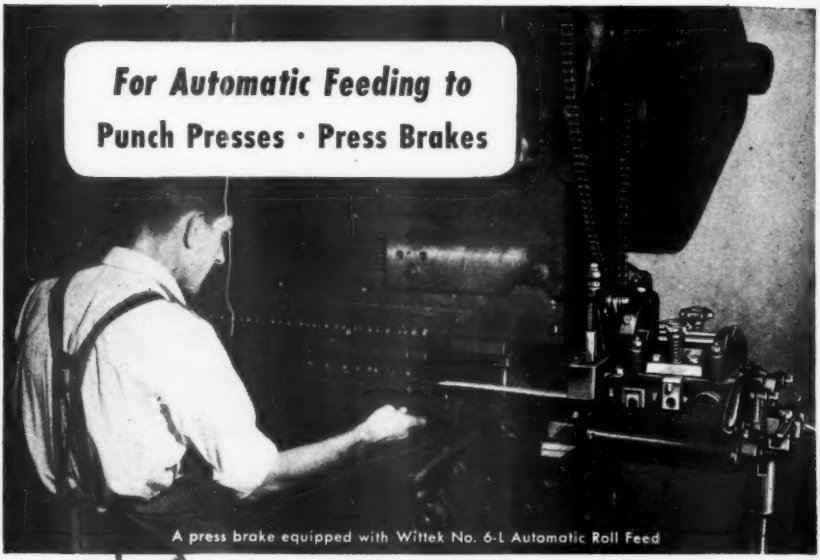
listing all types, shapes, sizes and cuts of Nicholson Rotary Files and Burs and giving useful shop information on proper selection, use and care of Carbide Burs.



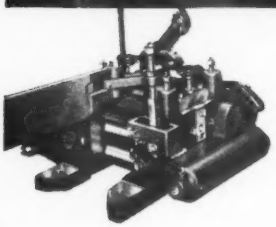
Precious tools like these deserve good care and wise protection against loss or damage. When purchased by the standard set of twelve, these diminutive Nicholson Carbide Burs come encased in the handsome mahogany box shown above—at no additional cost.

NICHOLSON FILE CO., 95 Acorn St., Providence 1, R. I.

CSF ADVERTISERS INDEX—PAGE 100 FOR KEY NUMBERS



A press brake equipped with Wittek No. 6-L Automatic Roll Feed



You Can't Beat WITTEK

Wittek Roll Feeds are made in standard models to meet every requirement in the automatic feeding of strip stock to punch presses or press brakes. The distinguishing feature is their simple and economical method of operation which does away with complicated parts thereby assuring *speed* and *accuracy* in the feeding of various kinds and thicknesses of material.

Wittek Adjustable Reel Stands are designed as companion units to Wittek Automatic Roll Feeds and are available in seven different models to handle *ALL* types of coiled strip stock and wire being fed to punch presses or similar production machinery.

Special units of Wittek Automatic Roll Feeds and Adjustable Reel Stands are engineered to meet unusual requirements.

Write for complete descriptive literature

WITTEK Manufacturing Co.
4323 W. 24th Place
Chicago 23, Ill.

Automatic
ROLL FEEDS AND
REEL STANDS
WMCo

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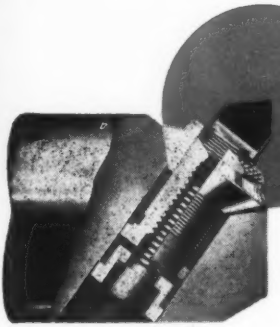
microbore

... aids defense conversion



TOLERANCES

10 years ago — 1 thousandth

today — 3/10 of 1 thousandth

In your conversion to defense work take advantage of using Microbore tools for precision boring and turning.

1 Meet the "new tolerance" levels of present production. Tolerance of current defense work is roughly three times as close as work during World War II.

2 Readily adaptable to your present machine. Fine boring machines (diamond borers), jig borers, turret lathes, horizontal boring mills, special boring machines.

3 Increased production of Microbore units provides for delivery from stock.

ILLUSTRATED CATALOG
MAILED ON REQUEST

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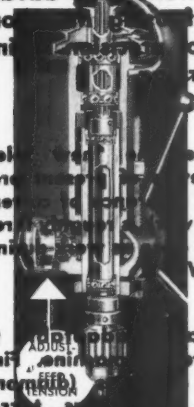
SEND US YOUR BORING AND TURNING PROBLEMS

DEVLIEG
MICROBORE COMPANY
480 FAIR AVENUE
FERNDALE 20, MICHIGAN, U.S.A.

SEE ADVERTISERS INDEX, PAGE 103, FOR KEY NUMBERS

Atlas DRILL PRESSES

Set NEW Quality Standards for Construction and Performance!



WIDEST COLUMN BEARING — GREATER RIGIDITY
DEPTH CONTROL STOP DIRECT READING, ADJUSTMENT
10" x 10" PRECISION
TABLE TILTS ANY
OR RIGHT—LOCKS

...s drill press you ... accuracy, service, ... than any comparable size drill press on the ... Long accurate life is assured by the exclusive "floating drive" ... splined spindle and steel ... sleeve ... ball bearings. Tu... ball bearings—w... spaced —float spind... from quill. Spindl... quill ... and ... clude ... heavy ... struction of head, table, column and base ... exclusive quill-stop bumper — coordinated locks for head, table *and* spindle — wide-spaced column bearing surfaces in head.

NOW 50 Atlas DRILL PRESSES delivery from stock To Meet Industrial, Commercial, School and Home Shop Needs

And such features as the exclusive vernier-type depth stop, adjustable feed tension, three spoke feed wheel and built-in switch make operating easy.

Atlas gives you the greatest drill press value in every comparison. Gives you *several tools in one* for a host of money-saving and work-saving jobs. See your Atlas dealer or write for free catalog.

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DEPENDABLE QUALITY TOOLS

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YOU are sure of bui
specify "DETROIT"
start, every set is a
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testing facilities are available. Precision
standards are constantly maintained to
enable mounting of die in die set in less
time, and to obtain longer trouble-free pro-
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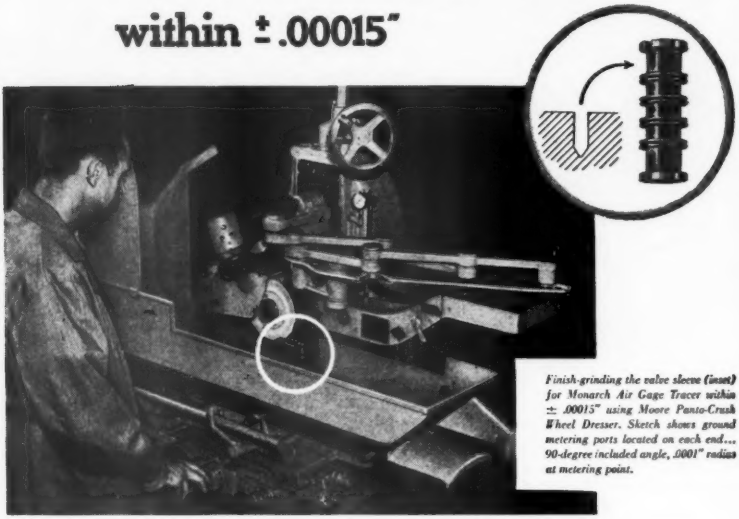
DETROIT DIE SET CORPORATION
2895 W. GRAND BLVD. DETROIT 2, MICH.

ADD MODERN TOOLS TO YOUR TOOLROOM

Moore Wheel Dresser Keeps Monarch Air Gage Tracer Part within ± .00015"



Finish-grinding the valve sleeve (inset) for Monarch Air Gage Tracer within ± .00015" using Moore Panto-Crush Wheel Dresser. Sketch shows ground metering ports located on each end... 90-degree included angle, .0001" radius at metering point.

1951's machine tools produce with unprecedented speed and accuracy because advanced tools fabricate their complex new operating features.

Take tracer-controlled duplication machining, pioneered by the Monarch Machine Tool Co. of Sidney, Ohio. Every component of the Air Gage tracer hydraulic valve for Monarch lathes is completed to tolerances ranging from .0001" to .0003" in what Monarch employees call their "Tenths Room."

An important part of this room is the Moore Panto-Crush Wheel Dresser*. Mounted on a surface grinder, it makes possible the finish-grinding of the metering ports on each end of the valve sleeve. These ports have a 90-degree included angle with a ten-thousandths radius at the metering point. Depth must be held to plus or minus .00015".

No other method could accomplish this as quickly and accurately as the Panto-Crush Wheel Dresser. This unit *combines* crush-forming and diamond dressing. Either method is immediately available. Switching from one to another disturbs neither the work-setting nor the location of either truing device with respect to the wheel or workpiece.

Ask for literature describing the device in detail, including reprints of articles appearing in technical magazines.

*Another is a Moore Jig Borer.

MOORE SPECIAL TOOL COMPANY, INC.
726 UNION AVENUE, BRIDGEPORT 7, CONNECTICUT

ADD MOORE TOOLS TO YOUR TOOLROOM

JIG BORERS • JIG GRINDERS • PANTO-CRUSH WHEEL DRESSERS • DIE FLIPPERS • MOTORIZED CENTERS • HOLE LOCATION ACCESSORIES

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Precision machining of **PRODUCTO**

DIE SET

maintains close tolerance production

for **OTIS ELEVATOR COMPANY**

Actual size of Magnet Frame, 1 9/16" x 4 13/16"

The 3 station progressive piercing and blanking die, mounted in a Producto Die Set, produces the Magnet Frame (shown at right) for Otis Elevator Company. It is used in the Magnet Switches which compose the floor selector system for automatic stops thru the push button panel.

Thickness of steel frame is .092"-.096", size 1 9/16" x 4 13/16". For this relatively rugged application a tolerance of ± .002 is maintained. Production averages 750 pieces per hour, 18,000 between grinds.

The excellent performance of this die is tied right in with the accurate alignment of the Producto Die Set guide pins and bushings and precise parallelism of punch and die holder. Rejects are minimized, die life extended and improved production assured. Specify Producto for competitive advantage in today's high production economy. Send for New 72-Page Catalog No. 10 . . . complete listings of all Producto Die Sets and Accessories.

Call PRODUCTO in your classified telephone directory . . . representatives in 35 main stamping centers.

THE PRODUCTO MACHINE COMPANY

970 Housatonic Avenue, Bridgeport 1, Conn., Tel. 4-9481

Automatically maintains the proper gripper plate angle. No tools of any kind are required to make adjustments for gripping pressure or feed length. Hitch Feed will handle the feeding of intricate multi-progressive dies, as well as simple blanking and piercing operations. The design of the new Dickerman Hitch Feed allows it to be easily mounted on any press or to the die-set. The massive main frame and moving members and Carbide wear and gripping plates assure users of many years of service. Write for detailed information.

H. E. DICKERMAN MFG. CO.

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• SPEEDS PRODUCTION • CUTS COSTS

Gorton Tracer-Controlled Pantographs and Duplicators speed up production on military or industrial contracts. High surface finish results from spindle speeds up to 45,000 R.P.M. Accurate reproductions from one to ten of over-size masters, patterns, or templates together with the reduction ratio which is exclusively characteristic of the pantograph. Whether a dozen or a thousand pieces, each is identical to the first. Work piece size varies from instrument parts to areas of 10 to 20 feet.

Gorton tracer-controlled equipment quickly pays for itself in profitable routing, duplicating, contouring, profiling, chamfering, grooving, graduating, engraving as well as many other standard or special operations on ferrous or non-ferrous metals and plastics where accurate duplication of irregular, cylindrical, spherical or irregular in shape.

Mail the coupon below for General Catalog illustrating the complete Gorton line.

PRODUCTION DATA—SMOOTH HOLES THREADED HOLES

MATERIAL: Aluminum alloy

CUTTER: 5/32" dia. single flute, fast spiral H.S. steel running at 3,900 R.P.M., without coolant

MASTER: 2 masters: one for male and one for female sections; 3 times oversize, [illegible] manually

HOLDING FIXTURE: Pneumatic-tubular internal expanding type

ALTERNATE METHODS: None

GEORGE GORTON MACHINE COMPANY
1203 Racine St.

Firm _____
Name _____
Title _____

SMOOTH HOLES THREADED HOLES

"AS SPECIFIED"

At spots where small, precision holes must be produced on fast production schedules, and where no excuse for failure to produce "as specified" is good enough, the Hamilton line of small hole, super-sensitive drills and tappers enjoy the full confidence of the men who are charged with responsibility for getting the job done.

Year after year, 80% of the sales of these machines are to those who know them through use.

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The advantages of V 20 bond wheels are best realized on production jobs where they provide extra efficiency and economy in fast, accurate tool grinding. Stock removal rate is high at reduced wheel pressures. With a minimum of heat generation and excellent form holding qualities—long lasting V 20 bond wheels impart a uniform fine finish that extends tool life between grinds. The effective use of fewer grades, (smaller inventories) to do a variety of jobs is another advantage often realized.

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makes ALL abrasive products . . . to give you the proper ONE

"Carborundum" and "Aloxite" are registered trademarks which indicate manufacture by The Carborundum Company, Niagara Falls, New York.

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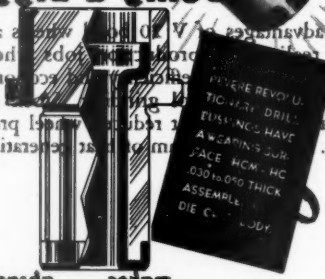
Revere Revolutionary Drill Bushing Cores are made of Super Pressed, High Carbon, High Carbon Steel.

SAVE ON INVENTORY

Revere Revolutionary Drill Bushings are assembled from complete stocks near you.



REVERE REVOLUTIONARY DRILL BUSHINGS have all the accuracy of solid type bushings. 30 years of continuous bushing manufacturing experience, plus the new methods, mean *HIGHER QUALITY* and *LOWER COST*.

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life and higher speeds with perfect rises. No layouts required. No special skill or experience necessary. Now in use across the country

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COMPANY

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Belongs in your plant

Abrasive's M34 Surface Grinder puts power where it does the most good — into the grinding wheel. The 6" segmental type grinding wheel is direct driven by a 5 HP, 3450 R.P.M. Pope Motorized Spindle. There are no friction losses due to belting, gearing, chains, or other power-consuming types of drives. For precision grinding of flat dies, washers, punches, spacers, parallels, chasers, raising blocks, etc., you just can't beat the M34.

THERE ARE MANY OTHER IMPORTANT FEATURES OF THE M34 VERTICAL SPINDLE SURFACE GRINDER:

Capacity: 24" x 8" x 12" high.

Automatic down-feed: from quarter of a thousandth to .002" at each table reversal.

Table feeds: power longitudinal feed with hydraulic shock absorber to reduce shock at reversals. Hand transverse feed.

Unit bed construction: Single casting, heavily ribbed for utmost rigidity.

Lubrication: mostly by Bijur One-Shot oiling system.

For complete details, write ABRASIVE MACHINE TOOL CO., 16 Dunellen Road, East Providence 14, Rhode Island.

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Abrasive Quality Is Reflected in the Finish of Your Product

ABRASIVE
ACCURACY BOOSTS PRODUCTION

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Toggle—a typical pushing operation.

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Air or hydraulic power—applied by T-J Cylinders—gets an amazing lot of tough jobs done for industry . . . *faster, more efficiently,* and *at lower cost!* Check your plant operations and machines *now*—make a note of mechanical movements that can be simplified and speeded up with T-J Cylinders! Designed for a wide range of pushing, pulling, lifting, clamping or control jobs . . . 100 lb. or 50,000 lb. Many standard sizes and styles . . . both cushioned and non-cushioned types . . . precision-built, dependable. Write for additional information. The Tomkins-Johnson Co., Jackson, Mich.

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BREAK
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YOUR PART

WITH
PROTECTRON
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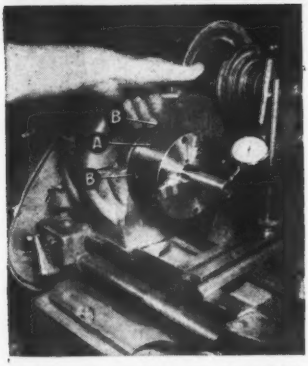
Buck AJUST-TRU **CHUCKS**

HANDLES MORE JOBS THAN ANY OTHER CHUCK!



THIS IS HOW IT WORKS

Pinion "A" moves jaws in or out to grip work like any scroll chuck. 4 opposed screws "B" (only 2 shown) bring work to dead center. It's as easy as it sounds. Inexperienced men can center work within .0005 in 3 minutes! Once set dead true, you can machine hundreds of duplicate parts without changing adjustment!

1. .0005 precision with scroll chuck rechucking speed.
2. Handle collet and step-collet work.
3. End most stub arbor, mandrel needs.
4. Adapt to dividing heads, grinders, screw machines, lathes.
5. Minimum overhang — grips work closer to spindle for greater accuracy.

THIS is the most amazing chuck advance in 50 years! One Buck chuck—*at ordinary scroll chuck cost*—will handle the work of special equipment worth $250 or more! Take collet work for example. Buck chucks have spindle capacity *by .001* from ⅛" to 1½". 6" chucks have step collet capacity—*by .001*—from ⅛" to 5". That's *part* of the story. Send for all of it.

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3 STEP-JAW CHUCK
3 sizes—
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5", 6"—heavy duty

6 STEP-JAW COLLET CHUCK
3 sizes—
4"—light duty
5", 6"—heavy duty

6 JAW PRODUCTION COLLET CHUCK
3 sizes—
4"—light duty
5", 6"—heavy duty

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CUTTING TOOL FACTS

Here is the latest information — directly from Accuracy Headquarters — to help you do *precision* work and more of it with

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Check the corresponding numbers below for the literature you want. No obligation, of course.

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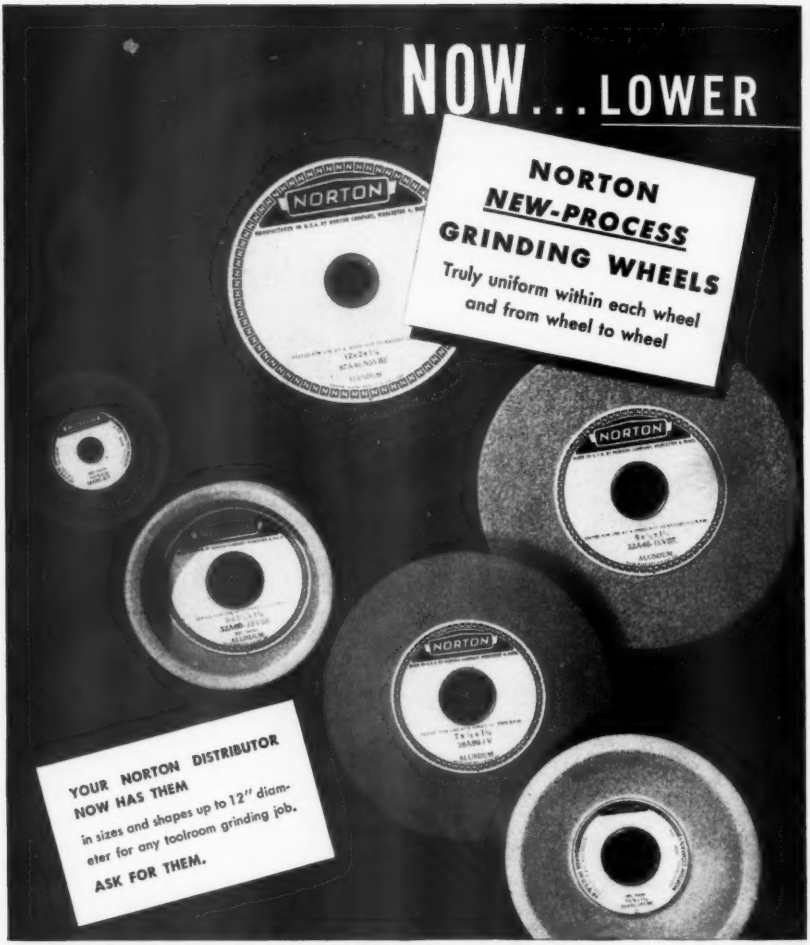

WHAT IS THE NEW NORTON PROCESS?
Developed and installed by Norton engineers in a new 5-acre plant, it is a streamlined, precision process that produces grinding wheels to a degree of uniformity never before thought possible. The process involves production equipment and quality control methods that assure the uniformity of all mixing, molding, firing, and finishing operations. The result: uniform structure, inherent balance and grinding efficiency unmatched in the entire abrasive field.

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YOUR TOOLROOM GRINDING COSTS

with the most uniform wheels ever produced!

Only Norton *New-Process* Wheels Give You All 3 Advantages

1. BUILT-IN BALANCE reduces vibration in operation. The wheel hugs the work. You can grind to closer tolerances and smoother finishes. No more chatter marks! What's more, this balance is inherent. It stays for the life of each wheel.

2. MORE UNIFORM STRUCTURE means consistent grinding action throughout each wheel and from wheel to wheel . . . more even wear for longer life . . . fewer machine adjustments . . . less risk of tool spoilage . . . assurance that all wheels with identical markings will give you the same top-grade performance.

3. FASTER, SMOOTHER, MORE EFFICIENT CUTTING ACTION comes from the right selection of the various Norton abrasives plus the features of the *new process*. These wheels allow deeper cuts in expensive, heat-sensitive high-speed steel and cast alloy tools without drawing their temper. They also stay sharp longer . . . make frequent dressings unnecessary . . . a big saving in time and toolroom grinding costs.

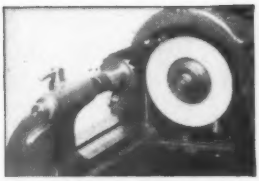
RUN A TEST! If you haven't already standardized on Norton *New-Process* Wheels in your toolroom, run a comparative test right away. Your nearby Norton distributor or representative will help you select from the several types of Alundum* abrasives the wheels that will cut your costs on any tool grinding job.

NORTON COMPANY, Worcester 6, Mass.
Warehouses in 5 cities. Distributors in all principal cities.

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

NORTON
ABRASIVES

Making better products to make other products better



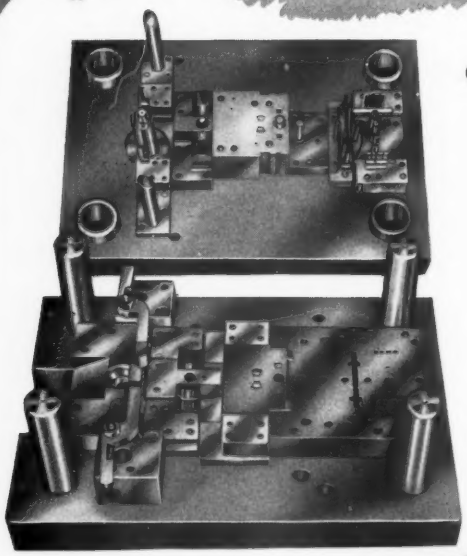
YOU SAVE TIME sharpening spiral milling cutters with Norton *New-Process* Alundum Wheels because they stay sharp and hold their size much longer than ordinary wheels.

YOU REDUCE SPOILAGE in backing off reamers with Norton *New-Process* Alundum Wheels because their free, cool cutting action does not draw the temper.

YOU GET CHATTER-FREE FINISHES when you use Norton *New-Process* Alundum Wheels on your toolroom surface grinders because their built-in balance makes them run smoother.

YOU GET ALL THE FACTS about lowering toolroom grinding costs in this 162-page handbook on Toolroom Grinding. Write for your free copy of FORM 835 A11

SEE ADVERTISERS INDEX, PAGE 103, FOR KEY NUMBERS



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You pay for Precision Dies— why not get them!

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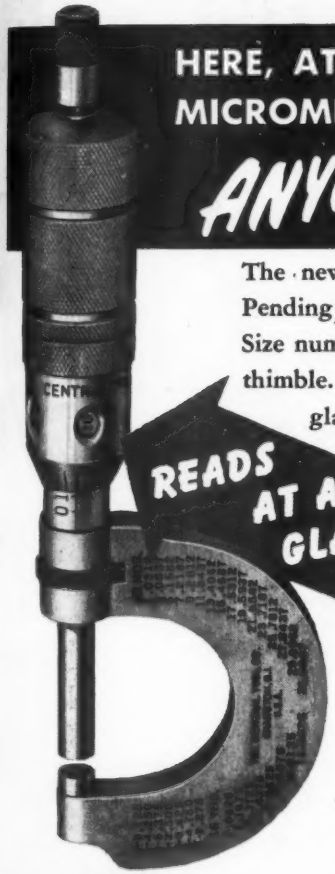
HERE, AT LAST, IS A MICROMETER ANYONE CAN READ!



The new Central Read-Rite Micrometer (Patent Pending) has its own built-in "adding machine". Size numbers automatically appear as you turn the thimble. When the correct "feel" is obtained, a glance at the thimble and barrel gives you instantly the true measurement, without complicated figuring, without danger of costly mistakes. Even green, unskilled workers can read this tool *right* every time.

The Read-Rite is available in two polished frame models, 0 to 1" (illustrated) and 1" to 2", and six black enameled frame models with a combined range of 0 to 6".

CENTRAL Certified Accuracy MICROMETERS

SPECIALISTS IN FINE MICROMETERS FOR OVER FIFTY YEARS

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Gentlemen:
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☐ Descriptive Catalog 30 listing Read-Rite and other Central Micrometers.

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THE CENTRAL TOOL COMPANY
CRANSTON 10, R. I.

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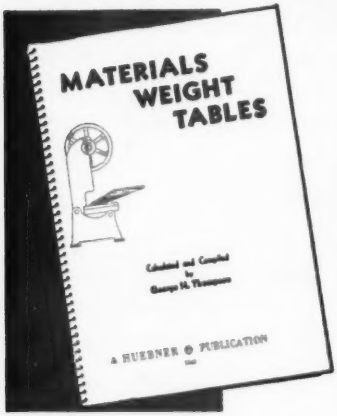
COMPUTE stock weights QUICKLY
with Geo. H. Thompson's



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Dielectric Heating for Plastics Production is comprehensively described.

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OVER FORTY YEARS OF FINE TOOLS

SIEWEK

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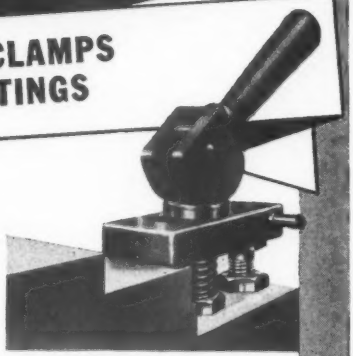

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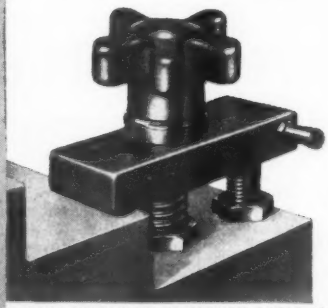
Drill Jigs	161 Sizes
Fixture Clamps	73 Sizes
Fixture Details	156 Sizes
Fixture Locks	12 Sizes



JACK LOCKS, FIXTURE LOCKS, CAMS, KNOBS, REST BUTTONS

Clamp assemblies and other parts necessary for the construction of special fixtures make up this standard Siewek line.

These Clamp assemblies themselves are made in 36 different types, most of them in three sizes. In other words, there is a type and size to meet the requirements of practically all shops.

Write for full size template drawings for use in layout work.

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Siewek TOOL COMPANY

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They're ready for *tool steel*..
They're DIE-CO!

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to your specifications

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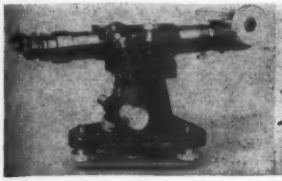

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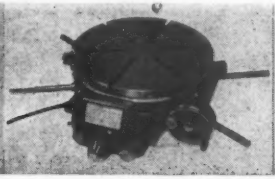

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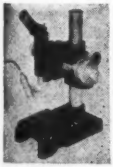

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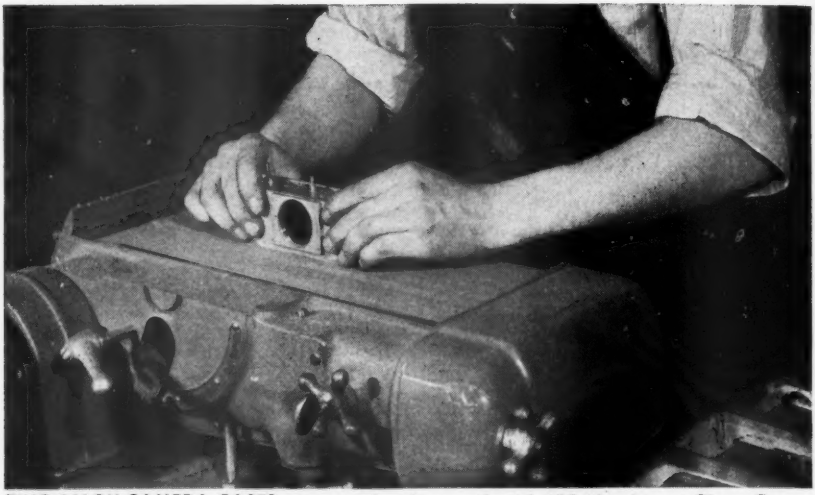

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TOOL & DIE JOURNAL

editorial: "the challenge of shortages" ....

— features —

"An Example of Cost Reduction Through Material Positioning at the Machine," by John Schinner ....

An accounting of materials handling ideas that are applicable to other great savings in manpower, machine materials and other products.

"Special Tooling for Throttle Shaft Production and Precise Gaging of Overrunning Clutch Rings," by Herbert Chase ....

Mr. Chase describes a Ford screw machine job that was retooled for screw machines and special machines in combination. An example of a large variety of operations performed on a long, slender workpiece. The precision gaging part of the story covers the development of gaging equipment for the rapid and precise checking of one of the Chevrolet Powerglide transmission parts.

"Production Tooling for Machining a Vital Aircraft Part," by F. W. Straehle ....

The concluding installment of this description of the tooling program covering an intricate shaped forging deals with the inspection operations; metallurgical as well as dimensional.

"Machining the Stainless Steels," by Lester F. Spencer ....

Part III of this series treats the operations of drilling, tapping, threading, reaming, skiving, milling, broaching and shaving. For the various grades of stainless, recommendations are made as to speeds, feeds, and tool types and angles.

"The Step-by-Step Construction of a Henry Draw Die," by Cashly A. Henry ....

A pictorial treatment of the construction procedures followed in building a die by the Henry process for the production of a stove part. This is a follow-up of Mr. Henry's earlier article dealing with comparative costs of die construction methods (see TDJ, September, 1950, page 47).

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"Hot Pressing Produces High-Strength Carbides," by John L. Ellis 64

In concluding this feature, presented last month, Mr. Ellis describes the dimensional accuracies attainable by applying the hot-pressing technique to the making of tools, dies, and molds.

"Die Casting Die Design," Part IV (continued), by H. K. Barton and James L. Erickson 72

The authors thoroughly explore the factors to be considered in positioning the runners within the molds: route, turbulence, types, capacity, thermal influence, solidification, and branches.

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Here's a wealth of information, but too much to carry in your head. Study it over and file it; then you'll have it when you need it.

"PROGRESS ON PARADE" 142

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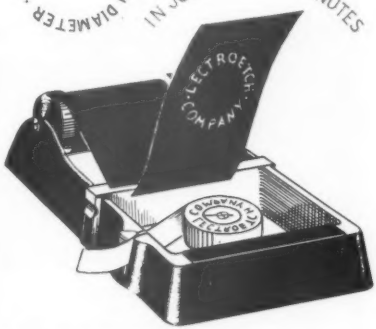

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editorial

the challenge of shortages

We are moving head on into an economy of shortages; shortages in manpower and skills, shortages in raw, processed and fabricated materials, and shortages in time.

Whether these shortages are due to natural causes or to maldistribution makes no difference in that they have to be reckoned with in meeting today's military and civilian production demands.

One of the most effective ways in which industry can overcome the hurdles imposed by shortages is by conservation.

Conservation is a challenge that may be met by ingenuity in design, tooling and production. Conservation is an incentive that pays off in producing more, in using up less stock, in doing the job with either fewer workers or with less-skilled workers, and in doing a job in less time.

It is something of a paradox that this country, which has attained the greatest achievements in TOOLING and PRODUCTION know-how, can, at the same time and in the same field of endeavor, **be guilty of uncounted waste.**

For example, we will devise intricate machines and ingenious tooling for producing a pump or gear housing and then, in final assembly, use screws that are ⅛" longer than necessary. Multiply that ⅛" by even modest production and we come up with an amount of steel worth saving, potentially usable for something else.

We will redesign a part so that it can be produced in its entirety on an automatic screw machine and thereby save time in its production. But does that effect all possible time savings? Not if a tool feeds in or a turret indexes in order to machine a surface that fits against nothing but air. And not if the stock has to cease revolving during part of the machining sequence, an extra stop and start.

Herbert Chase's article in this issue describing Ford throttle shaft production is an example of using two machines in order that one shall not have to make extra stops and starts. Net result: higher production at savings in time and money.

When we let machine operations and the accompanying work handling get out of step we are not making the most conservative use of one or the other, manpower or machinepower. While we endeavor to make the machine operator's job easier and less confining, we must, at the same time, increase the productivity of the partnership, man and machine, by giving the man better machines and tools to be in partnership with.

The work handling methods treated in John Schinner's Formica sheet processing story disclose greatly increased productivity through aggregate savings in manpower, machinepower, floor space and time.

Engineering ingenuity applied to product redesign, retooling, and to production and assembly line methods can disclose waste heretofore unsuspected, and once waste is discovered it can be eliminated.

The more we save, the more we can have to do with. Today, every processing, production and fabricating operation should be subject to continuing scrutiny as to potential conservation of manpower, machinepower, materials and time; a scrutiny that will anticipate and go far toward alleviating these shortages.

E. Willard Pennington

editor

An Example of Cost Reduction Through Material Positioning at the Machine

That materials handling entails more than the mere movement of materials from one place to another is attested by the following account of material positioning at the machine. The facts set forth are taken from the experience of the Formica Company, manufacturers of laminated plastic materials and products at Cincinnati, Ohio.

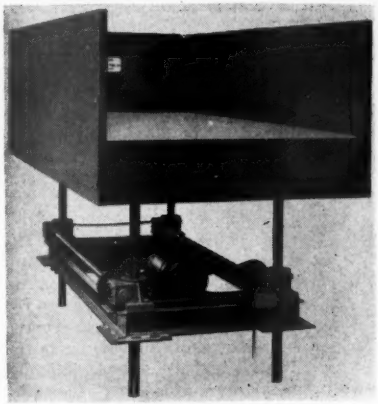
Although Formica laminated plastic is manufactured in a great variety of shapes, such as tubes, gears, wheels, pulleys, and the like, one of its most popular forms is a decorative, cigarette-proof sheet used for table, bar and counter tops. Formica material intended for such uses is made into sheets ranging in size from 24″ x 60″ to 36″ x 96″, and is available in a wide variety of patterns.

The process of manufacturing this Formica sheet material entails a high temperature, high pressure operation which is performed between plates of stainless steel, and sticking of the backs of the sheets to each other is avoided by the use of waxed paper. Hence the

by **John Schinner,**
Chief Engineer
The Formica Company
Cincinnati, Ohio

Formica sheets, as they come from the press, have an unwanted waxed paper backing, and the necessary removal of this waxed paper backing entails an operation which has, until recently, been extremely slow and expensive.

Originally the waxed paper backing was removed by running the Formica sheets through sanders. A battery of eight sanders was employed, and 5,000 sheets a day were processed on the average. But a "bottleneck" developed at the sanders, and became permanent. The ever increasing sales of Formica aggravated the condition until finally a remedy became imperative, and an engineering study was begun. This study



This shows a "Portelvator" before installation. The table area is 120″ x 60″. Its vertical travel of 38″ ranges from 27″ below to 11″ above floor level and the safety apron extends 24″ above and 12″ below floor level. A capacity load of 10,000 lbs. is lifted at 65″ per min. by a 7½ hp motor with reversing magnetic starter and gear driven limit switch. Push button up-down switches provide individual or synchronized table operation.

resulted in the removal of the eight sanders, with their flanking "feeding" and "receiving" tables, and the installation of four Micro-Grinders with "Portelvator" electrically operated, pit installed elevating tables for the positioning of sheet material being fed into the machines and the convenient receiving of sheets from the machines.

The following is a detailed explanation of the "before and after" operations and a summary of the results achieved.

October 18, 1948 was a typical "before the change" day. Eight sanders were in use, each sander being flanked by a feeding table on one side and a receiving table on the other. The Formica sheets were rolled, about 200 sheets to the load, on four-wheeled trucks from the press to the sander. The truck was rolled to a

A stack of Formica sheets being fed into the Micro Grinder. Because of the number of sheets still to be processed, the Portelvator is considerably below floor level. As the stack diminishes, the operator will, by push button control, raise the Portelvator to compensate, thus keeping the top sheet always at proper feeding level. When required, proper feeding level can be maintained automatically.

This view of the Micro Grinder "receiving end" shows the final operations as the Portelvator gradually lowers into the floor pit. This down-travel compensates for the increasing height of the stack of Formica sheets as they come to the truck from the grinder. The thin boards of plywood serve to separate the several different sizes of Formica sheet going through the plant on the same truck.

position beside the "feeding table", and the sheets were processed in six separate movements as follows:

1. A sheet was removed from the truck and placed on the feeding table.
2. The face of the sheet was covered with a sheet of cardboard to protect it from the possibility of damage while being sanded.
3. The Formica sheet and the cardboard protective covering were fed into the sander.
4. Sheet and cardboard were received on the "receiving table".
5. The cardboard covering was removed from the sheet of Formica and passed back to the feeder for re-use.
6. The finished sheet of Formica was lifted from the receiving table and placed on a waiting truck.

This operation required the constant attendance of two men at each sander. The equipment, including the two trucks, occupied approximately 20′ x 8′ of floor space. Operating at maximum speed these eight sanders processed approximately 5,000 sheets of Formica during a 24 hour period.

By September 27, 1950 the eight sanders with their sixteen flanking tables had been removed. On this day the work was being done by four Micro-Grinders equipped with flanking Portelvators, and on this day 11,000 sheets of Formica were processed in the twenty-four hour working period.

Further, the work which had required six movements when done on sanders now required two movements. Also the work could now be done by one man at each machine. This relieved twelve of the sixteen men previously occupied at the sanders for duties elsewhere in the plant.

(Continued on page 111)

This is the manner in which two Micro Grinders and four Portelvators are installed at the Formica plant. This has made it possible for two men to attend two machines and for four men to produce twice as much as sixteen men formerly did; an 800% increase in manual effectiveness. Also, the sheets are handled 66⅔% less than before.

Special Tooling for Throttle Shaft Production and Precise Gaging of Overrunning Cam Rings

Ford carburetor throttle shafts, as shown in the above sketch, are produced, along with most other components of the assembly, at the Milford, Michigan, plant of the Ford Motor Company.

These shafts, 4¼" long, are cut from 0.276"-0.277" brass bar stock in Brown & Sharpe screw machines and then go through a special indexing multi-station Langelier machine that drills, countersinks and taps four cross holes, cuts a 1/16" x 2⅞" longitudinal slot and mills a pair of flats at one end of the shaft.

by **Herbert Chase, M. E.**
Forest Hills, New York

Formerly, the entire job was done on screw machines, including some multiple-spindle types, but, as milling, slotting and cross hole work require that the shaft be idle rather than rotating, the Langelier setup has proved better adapted to high rate production.

In the Brown & Sharpe setup, Figure 1, (which is entirely automatic although it requires half the time of an operator who also runs another machine) rod stock is fed down from a magazine and then longitudinally to a stop through a collet in the usual way. Although a six-station turret is used, it is double-tooled and so turns only 180° per shaft produced. Only four of the six stations require tools.

Feed is to a rocking stop, a ratchet being set so that short bar ends drop out. After feeding, the first tool on the turret cuts a center in the end of the piece and then the turret box tool turns a step diameter at the end on which flats are later cut on the Langelier. A tool on the cross-slide chamfers the rear end and also cuts the piece off. In this machine, 1440 shafts are produced per hour of operating time.

As Figure 2 indicates, the Langelier machine has twelve duplicate fixtures on the circular indexing table. Each is loaded and unloaded by hand and locked with a hand crank. Thereafter, the work-pieces are indexed under successive tools. Drilling and countersinking are done at the first two working stations and the holes are tapped at the next two stations where the motor reverses to withdraw the taps after these are fed down by lead screws.

Initial slotting is done by a saw that rotates in a horizontal plane and is fed

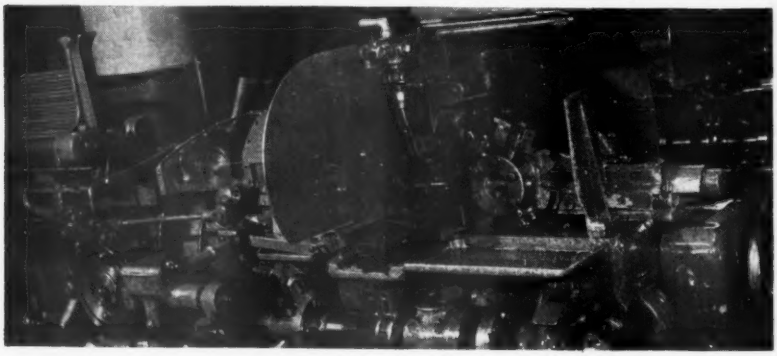


Fig. 3. Using a special air gage to check any taper relative to the axis that may occur on the eight inside cam faces in the cam ring, which is checked at each cam.

Fig. 4. This air gage is being used to check any deviation from true roundness over the outer diameter of the cam ring.

into the workpiece, the motion of the saw spindle being radially inward with respect to the indexing table. Flats are cut at the stations after slotting, using a straddle mill. The milling cutter is on a vertical spindle that feeds in radially with reference to the table.

Although the first saw for the slot cuts through the shaft, it does not finish the slot. The finish cut is made by a second saw that is fed radially outward in the same plane as the first saw which feeds inward. This second saw cut is made at the final working station and leaves the shaft ready for removal after the fixture indexes to the unloading station. With this setup, 2200 shafts are machined per eight-hour day.

Similar setups are used to produce choke shafts of ¼" diameter and 3½" long from aluminum bar stock. In this case, however, the slot is only 2⅛" long and only two cross holes per shaft are required. Both types of shaft are fed through centerless grinders after all other machine work is completed, which leaves the shafts ready for assembly.

(Continued on page 114)

Fig. 1. (left) From the magazine of this Brown & Sharpe set-up, brass bar stock for the throttle shafts is fed for the operations of centering, turning a step diameter, and cutting off. Double tooling is used in the turret.

★ ★ ★

Fig. 2. (right) Looking down on the twelve fixtures of a special indexing table Langelier machine that drills, countersinks and taps four cross holes in throttle shafts, saws a longitudinal slot and mills the flats on one end of each shaft.

Production Tooling for Machining a Vital Aircraft Part (Continued)

The machining and grinding operations performed on the aircraft planet spider; and the fixtures developed by the Straehle organization for holding the workpiece while converting the forged spider into a finished piece, have been described in the two previous installments of this article.

by **F. W. Straehle**
Consultant
Straeble Machine Products Co.
Cleveland, Obio

Inspection

Because of the rigid requirements of the government for accuracy of dimensions and tolerances on aircraft parts, a 100% inspection is made after each machining operation is performed on all the spiders as well as a final inspection.

The first inspection is a Magnaflux inspection made by the government on the forging, Y, Figure 6, after it is normalized. This inspection exposes fatigue cracks, flaws and other cracks developed in the part during the forging operation.

Magnaflux will expose flaws as deep as two inches below the surface and make them readily apparent to the eye, whereas such flaws could not be detected by a microscope. The Magnaflux principle consists of setting up a magnetic field in the part in the proper direction. Sudden interruption to this field, such as cracks or seams occurring at or near the surface of a part so magnetized, crowd some of the magnetic flux outside the surface of the part. These so-called leakage fields attract and hold finely divided ferro-magnetic particles. The inspector in examining these parts sees in the accumulation of particles a definite black line which indicates the exact location, extent and shape of the discontinuity. Experience enables him to formulate a definite opinion as to size, depth and relative importance of the discontinuity to the service life of the part.

Those forgings which pass this government Magnaflux test are stamped with the letter "M" and must be so approved before any machining operations can proceed. The forgings which have been passed by the government inspector receive a Rockwell hardness test by the Straehle inspection department. This test is made to determine whether the metal is soft enough for good machinability. To be sure that a correct hardness test reading is obtained, those surfaces which will be in contact with the plate and impression point of the hardness tester are thoroughly cleaned to remove the scale deposits. This cleaning is usually accomplished by grinding or belt sanding. A percentage of those pieces which passed the hardness test is then checked against the forging drawing to determine whether the forging die has maintained its shape and has produced forgings whose dimensions are within the specified limits.

Not until these preliminary inspections have been made are the forgings ready for machining. Because of the accuracy required in the machining of these forgings, and to avoid the possibility of any out-of-tolerance piece progressing to subsequent operations, an inspection is made of the piece after each machining operation. The sequence of operations is of no particular interest

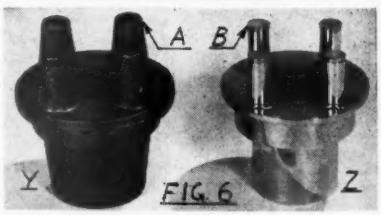


Fig. 6. The rough forging shown at Y is given a Magnaflux inspection by the government before any machining operations are performed.

to the inspection department. When the operation sequence is once established, the inspection department must approve it as meeting the blueprint specifications. It is then the duty of the inspection department to see that the sequence is followed. Before any change can be made in the sequence, it must be approved by the inspection department. This requires close cooperation between the production and inspection departments. It is understood that the inspection department must perform 100% inspection after each machining operation.

Figure 17 shows the operations performed in the first turret lathe setup: facing surfaces C, D, E, and F; turning diameters H and J; boring hole K; and undercutting L. These operations are then inspected according to the operation sheet and blueprint specifications.

The facing operations are checked by means of a depth micrometer, to determine the amount of material which has been removed and whether enough material remains for finishing the ends of stud S. This is important because the over-all dimension D-1, Figure 22, has to be held to a .005" tolerance. Parallelism and squareness of surface C, Figure 17, with the rough casting is checked by means of a test indicator mounted on a surface gage.

Diameters H and J are checked with

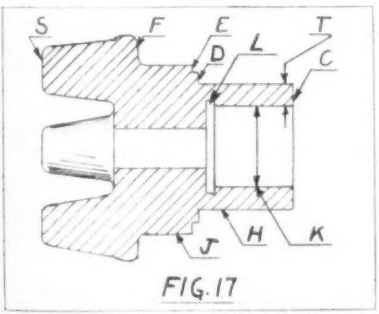


Fig. 17. Faced surfaces, turned diameters and the bored hole must be approved by the inspection department before any other machining can be performed on the workpiece.

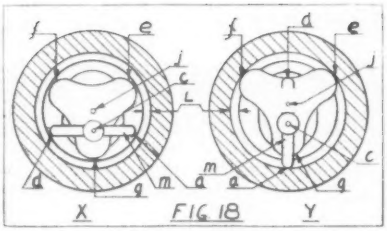


Fig. 18. Checking the depth of undercut, L, is done by a gage having a go and no-go blade placed eccentrically to the gage center.

an outside micrometer. Inside diameter of bore, K, Figure 17, is checked with a plug gage, and the depth is checked with a depth micrometer. The depth of the undercut L is checked with a thickness gage, and its diameter is measured with a specially designed gage, Figure 18, shown in cross-section drawn through the undercut. The dimension across the tips of the three fingers e, f, g is such that the gage can be readily inserted in hole K, Figure 17, and the thickness of the fingers permits them to easily enter the undercut, L. The axis c, Figure 18, on which blade m revolves is eccentric to the center, j, of the gage, and the blade is also of such thickness that it will swing easily into the undercut.

The length of blade m is designed so that "ca" and "cd" represent the go and no-go tolerances. The length of "ce" or "cf" plus "ca" is the acceptable dimension, while "ce" or "cf" plus "cd" is the rejected or no-go.

Figure 18-X shows hole K with the gage in place ready for making the test. Figure 18-Y shows the fingers "e" and "f" inserted in the undercut and the blade turned so that the end "a" is also inserted in the undercut. The blade is attached to and is rotated by the handle of the gage shown at c. This gage gives a positive check of the diameter limits of the undercut.

Although the outside and inside diameters can be within the allowable tolerance, it does not mean that the two diameters are concentric. If they are not concentric, then the wall thickness of the part is not uniform.

(Continued on page 86)

Machining the Stainless Steels Part 3

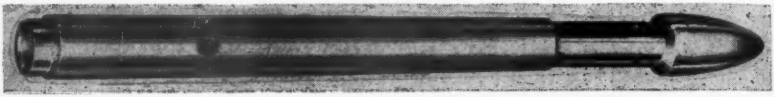


Fig. 6. A particularly interesting deep hole job. This stainless steel metering pin, 5.770" long, has a stepped diameter hole (.285, .218 and .156) drilled to a depth of 5.550".

Drilling. Accuracy in drilling is of vital importance, particularly in those instances where subsequent operations are located from the first drilled hole. In any drilling operation, the following factors are often stressed, [5] thus: (1) work must be kept clean; (2) drills must be carefully selected and correctly ground; (3) tools must be properly aligned and the work firmly supported; (4) the stream of lubricant must be properly directed; and, (5) the depth of hole to be drilled controls the number of bites required.

Where jigs are not used, marking with a sharp three-cornered punch rather than with a prick punch is usually recommended [5] in order to avoid work-hardening at the mark. Short drill lengths are preferred, and in the drilling of deep holes it is usually recommended to perform this operation in several steps. Usually, the rule [5] is to take three to four times the diameter on the first bite; one to two diameters on the second bite;

by **Lester F. Spencer**
Chief Metallurgist
Landers, Frary & Clark
New Britain, Conn.

and three-quarters of a diameter on the third bite. When drill size permits, it is recommended that a groove [5] be ground parallel to the cutting edge in the flute for chip clearance. Deeper holes can be drilled on each bite and tool life can be increased. If the hole "runs out," a good method to maintain concentricity is to rotate both the work and the drill.

The approximate feed is between 0.003" and 0.007" on drill diameters ranging from ¼" to ½"; this feed increasing as the diameter of the drill exceeds the range specified; and conversely, the feed decreases as the diameter of the drill decreases.

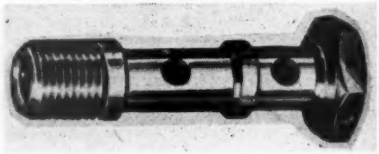
In the event of hand feeding, it is essential to apply adequate and constant pressure, this being particularly true with the austenitic stainless steels where work-hardening may occur if the drill dwells on the material. Whenever backing out the drill to relieve chip packing and congestion is practiced, it is necessary, upon re-inserting the tool, to insure that the bottom of the hole is not contacted before positive, cutting pressure is again applied.

The standard drill used for stainless steels has an approximate included angle from 130° to 140°; the drill being chucked short so as to obtain maximum rigidity. Long drills will tend to whip [5] and flex and may either easily break or cause inaccurate work. In instances where short chucking cannot be attained, a modified drill with both a heavy web and a short spiral is used; these drills having usually a 136° included angle with a heel clearance of from 9° to 12°.

Carpenter [5] recommends that lip clearances be between 9° and 15° and that the two cutting edges be of equal length and angle. They also recommend for drill grinding that fixtures be employed in order to obtain specified clearance, included angle and center location.

Liberal cooling should be employed, this being especially true in the drilling of the austenitic stainless steels; the function of the coolant not only serving

Fig. 7. This deep hole drilled nozzle screw has a stepped through hole (.520, .444, .360 and .204) almost 2" long. The workpieces of Fig. 6 and Fig. 7 are of type 416 stainless.



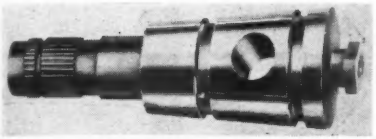


Fig. 8. Because precision tapping requires that the pre-tapped hole be accurate as to size, reaming may have to follow drilling. The left end of this stainless plug gage cock has a $\frac{5}{16}$"-32 E.F. thread, 1½" deep, class 3 fit.

as a lubricant and coolant, but also as a medium to wash away the chips.

Particularly interesting examples of applications are the jobs illustrated in Figures 6 and 7; the metering pin having a maximum hole depth of over 5½", while in the long nozzle screw is a hole drilled almost 2" deep. Both parts are made from type 416 stainless.

Tapping. This operation is usually the follow-through of a drilling operation, and the success experienced with tapping is directly related to the condition of the drilled hole. No difficulty in this operation should be experienced with the free-machining grades, but both the austenitic and the high-carbon stainless grades present more of a problem and more attention must be given to the selection of taps and equipment.

For all grades [2] a 15° hook grind has been found effective. According to Armco, general shop practices in tapping the stainless steels have resulted in the following recommendations, thus:

1. "Avoid tapping over 75% thread if possible. A 50% thread will be much easier to tap and in many cases will hold satisfactorily.

2. "Mount the tap in a properly aligned holder to avoid breakage when used in a turret lathe or screw machine. In some cases where exact alignment is difficult, a floating holder will prove satisfactory.

3. "Keep taps sharp at all times.

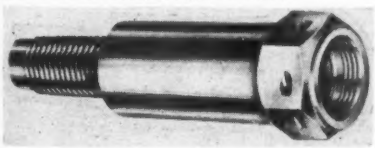
4. "For deep hole tapping, thin the lands by grinding the heels to reduce bearing areas, or use interrupted thread style tap.

5. "For large sizes (over 1" diameter), collapsible type taps are successfully employed. Grind collapsible type tap chasers with a 15° to 20° lip hook.

6. "For through holes use two-fluted taps, or the gun or chip driver type.

7. "When shortening a tap for bottom tapping, do not destroy the taper lead."

Fig. 9. Hook grinds on hobbed or tapped chasers may help in threading stainless. This nozzle body, stainless (type 416), heat treated to RC 33-40 is threaded $\frac{7}{16}$"-20 N.F.



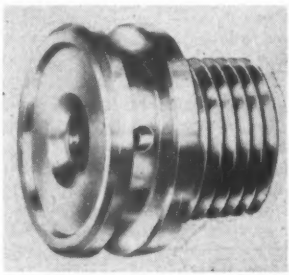


Fig. 10. When rough and finish threading operations are necessary, it is customary to leave .005" to .010" for removal in the finishing operation. This stainless (type 440) check valve seat carries a $\frac{5}{8}$"-18 N.F. thread.

Such factors as composition and structure of the material to be tapped, diameter and pitch of the tap, and the depth of the tapped hole will dicate the procedure to be used in tapping operations. The tough and harder the material, the lower will be the percentage of cut thread depth. In many instances, it is often necessary to tap twice; first roughing out the hole with an undersized tap [5], and then finishing to size with a second tap. According to Carpenter Steel [5], the following formulae can act as a guide in the selection of both the tap drill size and the percentage of thread, thus:

1. Tap Drill Size =

$$\text{O.D.} - \frac{.0130 \times \% \text{ Full Thread}}{\text{No. Threads per Inch}}$$

Example, for ¼" — 20 tap, 75% thread:

(Continued on page 60)

The Step-by-Step Construction of a Henry Draw Die

The first descriptions and applications of the Henry process of die construction were presented in TOOL & DIE JOURNAL September, 1950. They covered the production of automobile body sections and door panels, along with a breakdown of comparative costs. In this article, Mr. Henry shows by a series of shop photos, reproduced on the following pages, the step-by-step construction of a recent die job. Ed.

by **Cashly A. Henry**
Dayton, Ohio

Based on the performance of dies in use, we have undertaken to show that draw dies, forming dies, stretcher forms, etc., designed and built in accordance with the Henry method are not only less costly than conventional construction, but are also superior in ability to deliver continuous, trouble-free service.

The workpiece shown above was produced on one of several dies designed and built by the C. A. Henry Industries, Inc., for one of the country's largest stove manufacturers. This die is used on a Bliss No. 108 mechanical press equipped with air cushions and is operated continuously for long periods on a straight line production schedule.

The illustrations on the following pages show the step-by-step procedures followed in building the die.

Because the Henry process does not involve any change in the operational principles, any design for a conventional cast draw die or other forming tool can be changed to Henry construction in a very few hours.

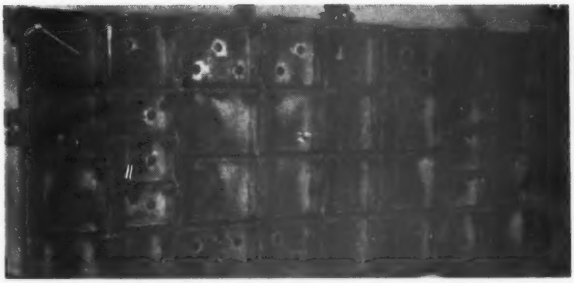
The advantages of a box section or honey-comb construction are too well understood by the engineering profession to need discussion here. However, a review of the physical properties of materials commonly used in the construction of large draw dies may be in order.

For conventional dies of this class the choice of materials is quite limited, the most commonly used being cast Kirksite for short runs, cast iron for medium runs, and cast steel for long, hard service. The physical properties of these three materials are shown in the accompanying table. For the Henry process construction, an almost unlimited number of alloys in a wide range of physical properties are available. A few of these are shown in the same table in bold face type.

In a future article the author will discuss automatic hydraulic units for trimming and piercing the drawn parts. Another will deal with the hot drawing and forming of magnesium and other fast work-hardening alloys.

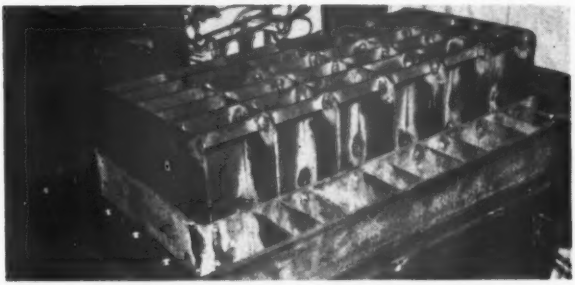
Material	Tensile Stress	Compression Stress	Shear Stress	Hardenability in Rockwell C
Kirksite	37,800	20,000	14,000	none
Cast Iron	22,000	100,000	24,000	poor
Cast Steel	70,000	70,000	60,000	34-40
Machine Steel	**60,000**	**60,000**	**45,000**	**20-25**
High Carbon Plate	**120,000**	**120,000**	**90,000**	**25-30**
SAE 3130	**165,000**	**165,000**	**130,000**	**32-35**
Airhard	**200,000**	**200,000**	**165,000**	**62-64**

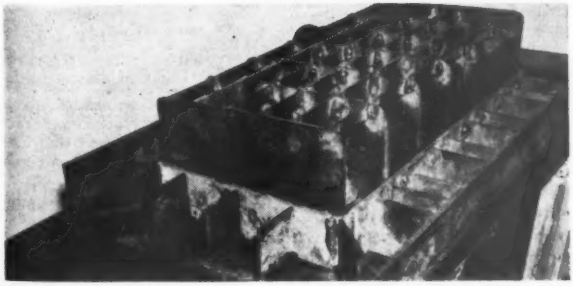
The base plate, previously tack-welded, is set up for finish welding. At this stage, all joints are arc-welded and guide bushings (not shown) are welded around the 28 air pin holes. The top plate, with holes for knockout pins, is built in the same manner.



A view of the start of the punch assembly. The cross ribs are cut to the contour of the part (minus cover thickness) and are placed 5" apart. Also, two rows of full depth longitudinal ribs are tack-welded in position between the contoured ribs.

This shows a few of the narrow longitudinal ribs which have been added to the punch, and the lower or floating draw ring is being assembled around the unfinished punch.





Another view of the floating draw ring which shows the manner in which gussets with thick wear strips are placed over each air pin hole.

(Continued on page 62)

. . . **Stainless Steel**

$$.250 - \frac{.0130 \times 75}{20} = .2013$$

(.201 = #7 drill)

Hence, #7 drill = tap drill size for ¼" — 20 tap, 75% thread.

2. Percentage of Full Thread =

$$\frac{(\text{O.D.} - \text{drill size}) \times \text{threads per inch}}{.0130}$$

Example, for ¼" — 20 tap, #7 drill:

$$\frac{(.250 - .201) \times 20}{20} = 75.4$$

Hence, a #7 drill and a ¼" — 20 tap give 75% full thread.

With close tolerance tapping it is essential to employ a tap with adequate chip clearance; usually a two-flute tap is used up to size No. 6, a three-flute tap is used from No. 6 to ½", and over this size a four-flute tap is employed. A three-flute tap is employed for deep holes, and where extra depth is required a chip-driver type of grind can be employed. Again it is emphasized that for precision tapping the drilled hole should be accurate, hence it may be necessary to ream to size. Also, precision ground taps should be used. Precision tapping requires well designed and balanced [2] equipment; oversize equipment causes lag and drag on the spindle. Figure 8 illustrates a typical tapping job, Class 3 fit, at a depth of 1½".

Threading. It is generally conceded that the self-opening die head chasers are used on sizes of ⅛" and over, while

(Continued on page 120)

STANDARD CHASER GRINDS [2]

Type of Head	Type 410, 403, 430, 431, and 446	Type 420, 420F, 440A, 440B, 440C and 440F	Type 302, 309, 316, 347, 321	Type 416, 430F and 303
Tangent	20° - 28°	15° - 20°	20° - 28°	10° - 20°
Circular	20° - 25°	15° - 20°	20° - 30°	20° - 25°
Inserted or Milled	10° - 12°	10° - 12°	10° - 12°	7° - 10°
Hobbed or Tapped or Solid	10° - 15°	7° - 10°	10° - 15° or Hook	7° - 10°

★ ★ ★

Horton Marks 100th Year as Chuck Manufacturer

The E. Horton & Son Company, Windsor Locks, Conn., is now in its centennial year. In 1851 Eli Horton established a factory devoted exclusively to the manufacture of lathe chucks.

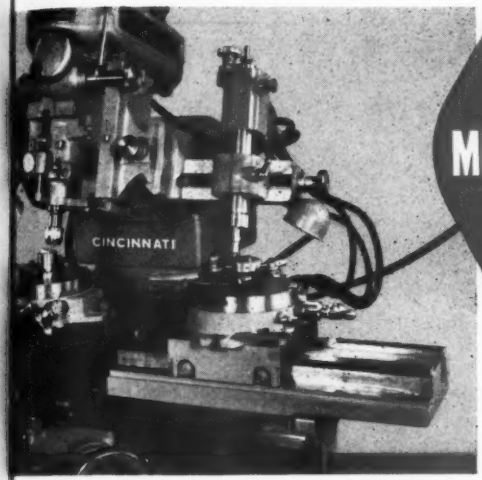
Having worked closely with Simon Fairman who patented the first universal chuck in 1834, Eli Horton had foreseen the growing demand for holding devices. He began first by producing his own universal chuck, but soon was making a variety of two-, three- and four-jaw chucks. His company's continuous and progressive program of design and manufacture has earned Horton Chucks an international reputation for excellence.

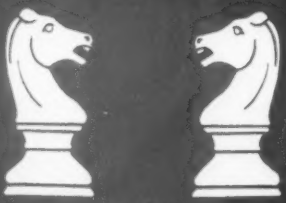
Today the E. Horton & Son Company produces a wide variety of chucks. Present officers are: Donald B. Huntting, president; Douglas H. Thomson, Jr., vice-president; and M. A. Caffery, secretary.

References:

(1) *Lester F. Spencer, "Machining Stainless Steel," Iron Age, July 7 and 28, 1949.*
(2) *Armco Steel Corp., Middletwon, Ohio, "Machining of Armco Stainless Steel," 1947.*
(3) *E. L. H. Bastian, "Metal Cutting Fluids," Iron Age, Feb. 10, 1949.*
(4) *Rustless Iron and Steel Corp., Baltimore, Md., "Machining of Stainless Steels."*
(5) *The Carpenter Steel Co., Reading, Pa., "Notebook on Machining Stainless Steels."*
(6) *American Society for Metals, Cleveland, Ohio, "Machining of Metals," 1938.*
(7) *Lester F. Spencer, "The Machining of Stainless Steels," Steel Processing, Jan. and Feb., 1949.*
(8) *R. P. DeVries, "Effect of Copper and Silicon on Stainless Steels," American Society for Metals, "Stainless Steels," p. 399.*
(9) *"Effect of Antimony in 18-8 and Plain Chromium Stainless Steels," Iron Age, May 16, 1946.*

eft-hand chessmen hobs are milled from right-hand asters on this CINCINNATI 8" x 18" Tool and Die Miller quipped with Reverse Image Attachment.





Milling a Left-Hand Hob from a Right-Hand Master

AND GETTING FINE DETAIL ALL AROUND

CINCINNATI 8" x 18" Tool and Die Milling Machine. Complete data may be obtained by writing for catalog No. M-1620-1.

eft-hand hob, copy milled from a right-hand aster . . . fine detail reproduced on all four sides! ese are the cost-reducing advantages offered CINCINNATI 8" x 18" Tool and Die Millers with equipment illustrated above. The "Reverse age" attachment on the machine table autoatically reverses the hob being milled, right-nd to left-hand, or vice versa. The two manually ntrolled Circular Milling Attachments allow the erator to position the work and master to obn the most accurate reproduction of detail on four sides. ¶Standard machine features also ntribute their share to the faithfully reproduced verse image hobs. The depth control unit is autoatic, hydraulically operated, and responds to a ounces pressure. The spindle head can be iveled forward and back, about a pivot point ar the end of the cutter. Antifriction feed screws eatly reduce operating fatigue. ¶Additional inmation about CINCINNATI 8" x 18" Tool and Die lling Machines may be obtained by writing for erature. Brief specifications will be found in veet's Mechanical File.

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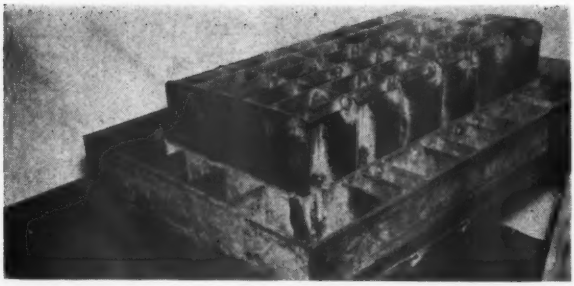
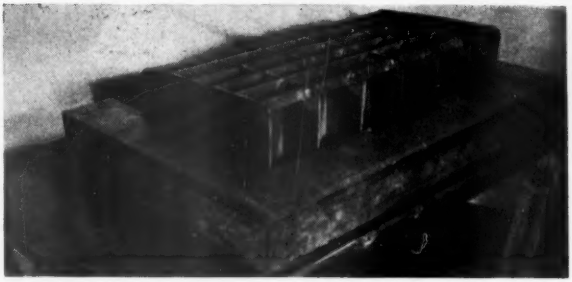
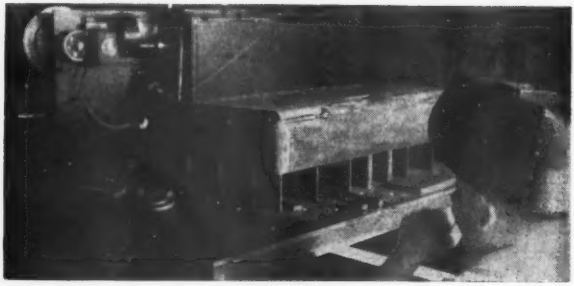
. . . from page 59



At this stage of construction, the end plate has been added to the floating draw ring and all of the parts have been tack-welded together.

Attaching the surface or blank-holding plates to the ring. After assembly, the draw ring is removed from the punch and finish-welded. The surface plates are hardened all over for wear resistance. The ring is again placed over the punch and the upper draw ring assembled in the same manner.

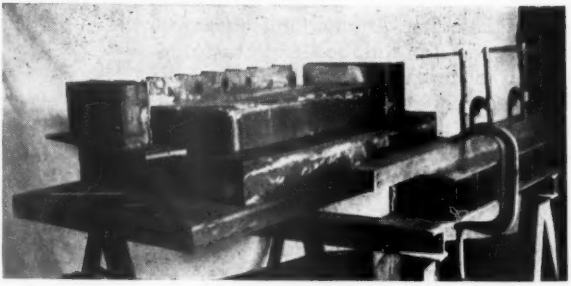


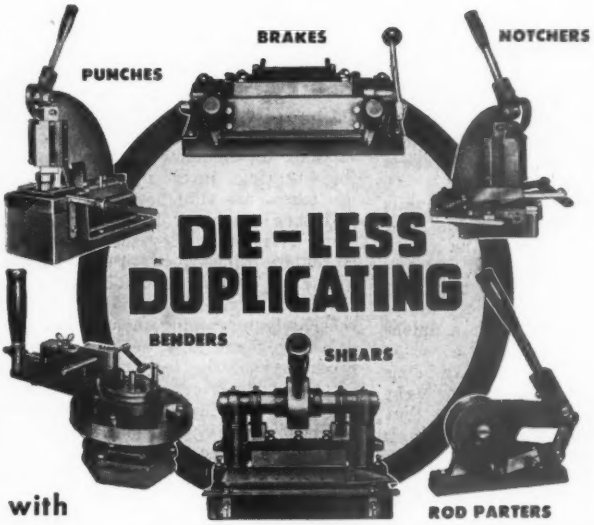


This shows the cover being applied to the punch. All seams of the cover are welded solid, both inside and outside, and then the punch is welded to the base plate. All points subject to wear are hardened.

The previously fabricated units of the upper draw ring are being assembled around the punch. Shims (not shown) are placed around the punch, and the draw ring units are clamped on before welding.

(Continued on page 66)





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SEE ADVERTISERS INDEX, PAGE 103, FOR KEY NUMBERS

Hot Pressing Produces High-Strength Carbides

(continued from last month)

Higher Dimensional Accuracies Achieved

In addition to improved physical and metallurgical properties, the hot-pressing technique permits the production of tools, dies and components to higher dimensional accuracies. This, because of two reasons:

(1) The hot-pressing process avails itself of precision-machined molds. For example, at Sintercast Corp., the standard tolerances maintained on a die having a 2-in. ID aperture are 0.002" to 0.004" per side as a manufacturing tolerance, and 0.003" to 0.005" per side as a finishing and lapping allowance.

(2) Since the part is constantly being kept under compression as it is brought to and kept at heat, the shrinkage that would normally occur during sintering without pressure (due to the contraction and change of state of the binder metal at raised temperatures) is avoided. Thus, the tool or die emerging has the precise dimensions imparted to it by the mold and in most cases requires a minimum of finishing work. The highly polished working surface required for maximum die life can be achieved more easily with hot-pressed carbides through subsequent grinding, lapping and polishing operations since they are virtually pore-free and possess a close grain structure.

Over and above the higher strengths, longer wear, and improved dimensional accuracies that can be achieved with this method, the hot-pressing technique has many inherent manufacturing advantages.

Hot Pressing Large-Size Dies

Extra-large-size, round, metal-drawing dies can be produced conventionally by either: (1) the cold-compacting and sintering method using a formed die or (2) the same method using an ingot mold. The first method requires the cold compaction of the powders to an oversize shape and the subsequent sintering to final shape and hardness. The powders are compacted in an oversize molding die to allow for shrinkage during sintering. In the ingot mold method, die forms are cold pressed, presintered, and then machined to proper oversized sizes. After this, they receive their final sinter to bring them to full hardness.

The hot-pressing method, using easily machined graphite molds, eliminates the costly machining, heat treating and finishing operations necessary for the production of the tool-steel molding die in the first method.

When using the hot-pressing method in place of the ingot mold method there

(Continued on page 68)

by **John L. Ellis**
Chief Engineer
Sintercast Corporation of America
Yonkers, New York

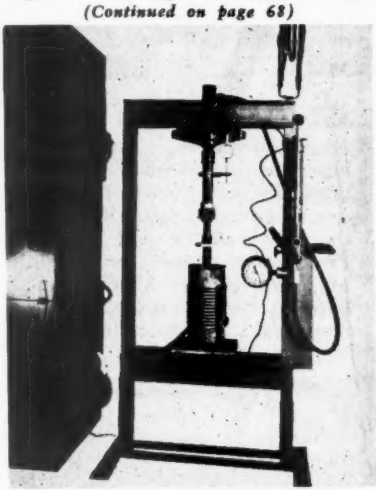

Fig. 5. Sinterforge hot-pressed tungsten carbide parts are produced in this and similar hot-pressing units. The hydraulically-actuated plunger develops up to a 4000-lb. load on the compacting plunger. The 12-kva high-frequency converter supplies current to the water-cooled induction coils. These, in turn, heat the graphite mold up to 3000°F.

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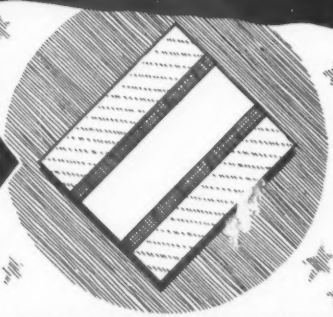

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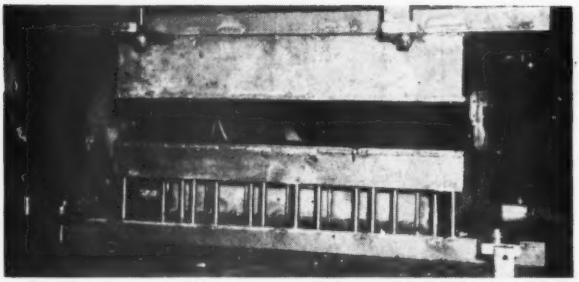
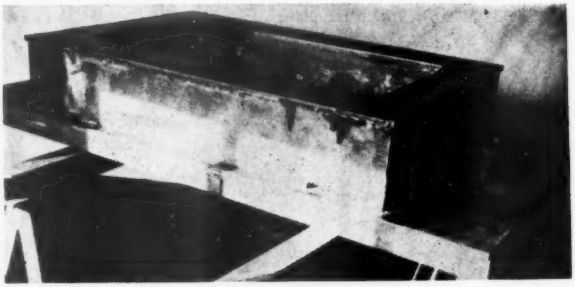


. . . from page 62

The die, complete except for guide pins, piercing punch, and knockout, being set up for preliminary trial. At this stage the die and punch are carefully aligned and the guide pins are installed.

Top plate and upper draw ring assembly. The knockout plate and a punch to pierce a hole in the bottom of the drawn piece are installed at this stage of construction.



Completed punch assembly: base plate, guide pins, floating draw ring, and punch with inserted die block for hole piercing. No machining is necessary to finish any part of punch or die. Hand-finishing or "spotting in" is employed as with conventional construction.

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SEE ADVERTISERS INDEX, PAGE 103, FOR KEY NUMBERS

. . . Hot Pressing, from page 64
are substantial material savings since only the proper amount of tungsten carbide powders are used and the customary material losses due to machining the ingot to shape are eliminated.

Hot Pressing Special Shapes

When producing tungsten carbide dies for drawing special shapes or contoured bars, hot-pressing often provides the only economical method. It is rarely practical to construct special cold-compacting tools for producing such special dies, particularly if only one or two pieces are required. The alternative to hot-pressing would be machining and broaching the shape from a presintered solid die ingot. Another alternate method consists of producing individual die sections by machining tungsten carbide pieces in the presintered state and fitting these sections together in such a way as to form the complete die nib.

Manufacturing Advantages

Thus, hot-pressing is the preferred and often exclusive method for producing solid die nibs in small quantities. The advantages of this method over conventional carbide manufacturing methods are closely linked to the advantages offered by a solid nib in comparison with a segmented die, as follows:

(1) The hot-pressed technique permits the production of solid nibs to special shapes with comparative ease. Even the approach form can be generated without great difficulty by blending the form of the core into the solid lower punch.

(2) With a solid die nib, the additional work involved in joint finishing is eliminated.

(3) In comparison with the split die nib, the solid nib is stronger. This, because the split die gets its strength from the casing or retainer ring only.

(4) A split die may have a tendency, particularly after use, to cause fins or markings on the product at the juncture between the sections. These fins would never occur if a solid nib die were used.

(5) The joint between the sections of a split die may be the starting point for flaking or chipping of the carbide which could mar the product or make the die unuseable.

However, the split die has the singular advantage of being able to be refinished and brought back to original size by regrinding the internal working surfaces and taking off a corresponding amount on the joint between the segments. This, of course, necessitates the regrinding of the OD in order to bring it back to a perfect circle, and the recasing of the nib. Although the split construction permits these refinishing operations, they may not always be economical.

Die Finishing Operations

Finishing operations on round dies use conventional techniques. Finishing operations on special-contour forming and drawing dies require special techniques which have been developed for that purpose. Special, slightly tapered laps are made in accordance with the shape desired. The initial lap, which is the smallest in order to get the operation started, may have a taper from about 0.004" to 0.008" over its length. Subsequent laps are increasingly larger and have less taper. The last or finishing lap may be absolutely without taper.

These lapping operations are performed by short-stroke reciprocating motions and are preferably carried out by hand in order to get the maximum sensitivity. Diamond dust is used as a lapping compound.

The construction of the lapping tools is an expense that has to be reckoned with. However, an advantage is gained once these tools are available since they can be used over again in the manufacture of subsequent dies of identical shape.

The number of lapping tools used for an individual job depends upon the length of the bearing surface of the die. The longer the bearing surface, the more lapping operations and lapping tools are required. For example, a drawing die for a ⅜" square bar may require two lapping operations to bring to desired size and finish. In contrast to this is a typical powder-metal compacting die with prismatic die barrel 1 inch long that may require as many as eight laps.

(Continued on page 122)

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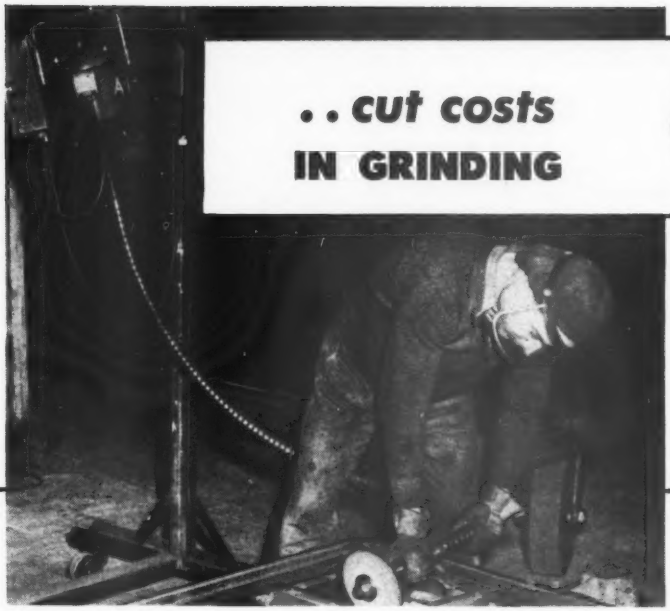

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SEE ADVERTISERS INDEX, PAGE 103, FOR KEY NUMBERS

Die Casting Die Design

Part IV (Continued)

Runner Design

The runner is a channel through which the molten die casting alloy flows during its passage from the sprue to the main die cavity. The design of the runner has a major bearing on the manner in which the molten metal fills the die cavity, thereby determining in a large measure the soundness of the die cast part produced.

Runners must be designed on the whole in such a fashion that they: (1) direct the flow of the molten die casting alloy from the sprue to the die cavity by the

by **H. K. Barton**
and
James L. Erickson

shortest possible route consistent with other factors to be enumerated; (2) do not create unnecessary turbulence in the molten alloy during its passage within the die; (3) do not cause undue local overheating of either of the die halves; (4) do not hinder the transmission of the applied injection pressure through the molten alloy from the sprue to the die cavity; and (5) do not restrict the even flow of molten alloy into the die cavity.

Runners should therefore be straight in design or, where necessary, of a sweeping curve type because such designs assure smooth, uninterrupted flow

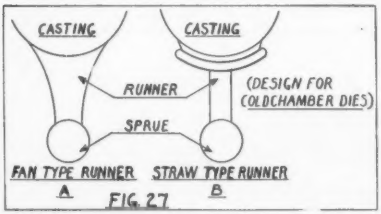

Fig. 27A. Fan-type runner.

Fig. 27B. Straw-type runner.

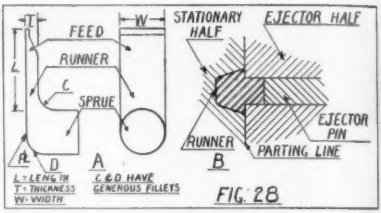

Fig. 28A. Sprue, runner and feed diagram showing length, breadth and thickness of runner. Note also, generous radius at C and D.

Fig. 28B. Cross-section of a runner cut in the stationary die half with an ejector pin lug projecting into the ejector half of the die.

of the molten alloy. We shall presently discuss a few exceptions, and the justification for these exceptions, to the above rule (1) regarding the **directness** of a runner.

In the meantime, however, we shall discuss briefly the various principal types of designs for runners of which there are two in particular, namely, the **fan**-type and the **straw**-type. The former is well illustrated in Figure 27A, while the latter is depicted in Figure 27B. Each of these two types of runners has its own advocates and each is currently receiving wide usage despite the fact that only the **straw**-type is preferable.

Of course, as we shall learn presently, the design of the runner cannot be logically considered by itself apart from the design of the **feed** and the **gate**, since the design of both the **feed** and the **gate** dictates to a considerable degree the manner in which the runner itself must be designed. Likewise, in the case of multiple cavity dies, the disposition of the die cavities themselves around the sprue determines to no small extent the **over-all** pattern of the runner system with its individual branch runners. It is, for example, impossible to employ a **fan**-type runner when the **feed** and **gate** are of small width (less than one inch).

(Continued on page 76)

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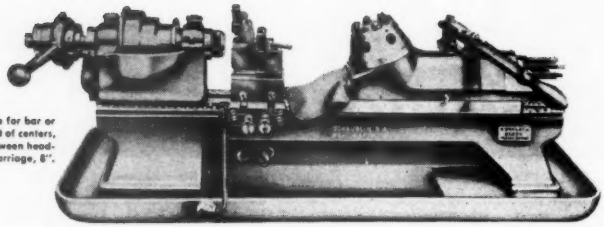

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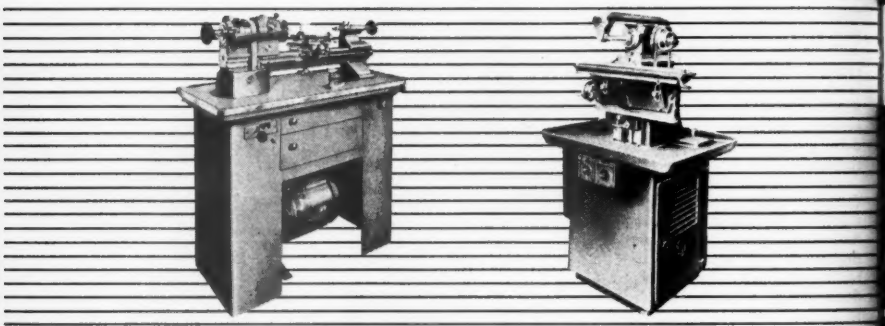

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. . . from page 72

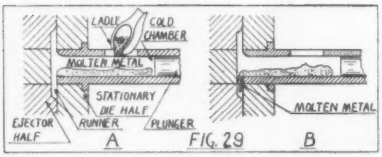

Fig. 29A. Cross-sectional diagrammatic sketch of cold-chamber die casting machine injection chamber showing molten metal spreading out on the chamber floor.

Fig. 29B. Same as Fig. 29A a fraction of a second later, showing how molten metal flows into an open runner leading downward from the sprue hole.

The manner in which the runner, or runners as in the case of multiple cavity dies, leads off from the sprue is a matter for some consideration despite the fact that few designers give very much thought to this phase of die casting die design.

As the molten die casting alloy flows from the sprue into the runner system, it must not be subjected to excessive turbulence as would be caused by an abrupt change in cross-sectional area, sharp or abrupt changes in the direction of flow, rough die face surfaces and/or surface imperfections in the die face. The runner cross-sectional area, therefore, should be carefully blended into that of the sprue, Figure 28A.

Additional Functions of the Runner

Besides its major function of guiding the molten alloy from the sprue to the die cavity and its possible use as a stabilizing agent in the thermal balancing of the die through its location in the die, the runner may also serve to:

1. Effect the shrinking of a spray onto the movable or ejector die half, thus keeping the spray from clinging to the stationary half during the opening cycle of the die. In case of this nature, the designer may cut his runner into the ejector half of the die and depend upon the shrinkage of the alloy between the runner cavity and the die casting to cause the spray to stick to the ejector die half.

2. Heat up one die half more than the other in cases where, for example, the surface of the casting formed by the stationary die half has to be free of cold-shuts and/or deep-seam lines, etc. Here the runner is cut into the stationary half, thus causing this die half to receive more heat than the opposite die half. Then, in order to assure the free pulling-away of such a runner from the stationary die half, ejector pins are situated in the ejector die half opposite the runner and the ejector pins, instead of being ground off flush with the face of the runner cavity, are cut short so that cavities are left ahead of the ejector pins, Figure 28B.

(Continued on page 84)

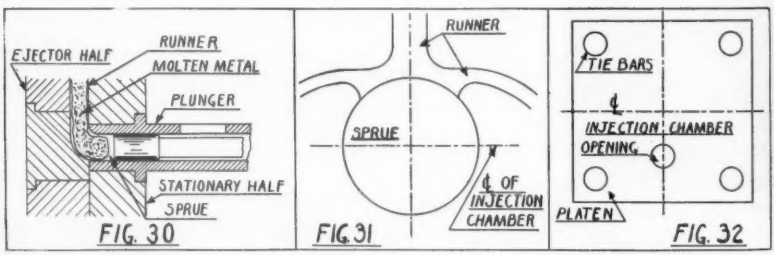

Fig. 30. Cross-sectional diagrammatic sketch of the injection chamber of a cold-chamber die casting machine with a runner leading upwards from the sprue. Fig. 31. Sketch showing how three runner branches lead off from the sprue above the sprue's horizontal center line.

Fig. 32. Face of stationary platen on a cold-chamber die casting machine showing how the injection chamber opening lies below the horizontal center line of the platen. Frequently, the level of the injection chamber opening is adjustable within the range from the bottom of the platen to its horizontal center line.

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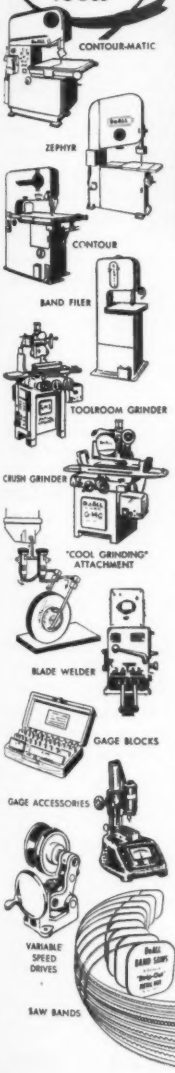

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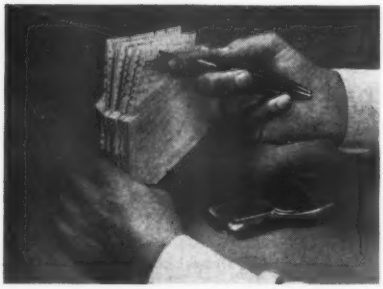
The body of the card itself is devoted to space for the job description, name and clock number of the employe, materials used, time used, machine or machines used, pieces worked on, etc. When referring to any specific factor indicated by the punch marks on the cards, a needle is used which picks up only those cards which are not edge-punched.

To illustrate taking the cards for any given period, it is possible to quickly sort out the cards of a specific employe by needling out those cards which do not have his number edge-punched. Thus such information as the amount owed the employe, time spent on any and all jobs, materials and machines used, etc., are made readily available for scrutiny.

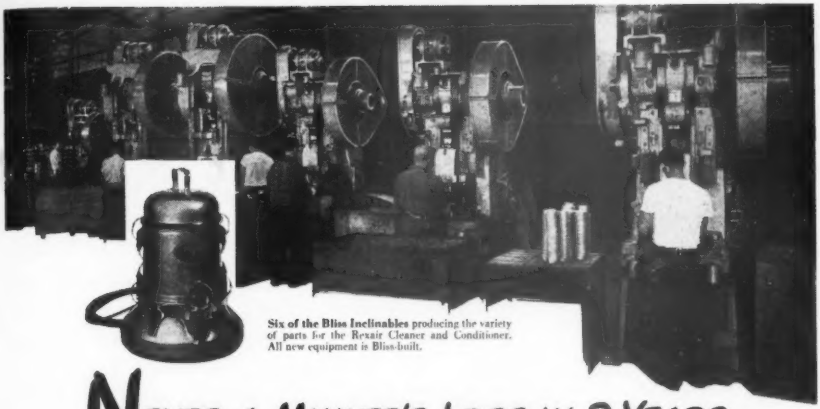


By the same method the tool shop operator can get all necessary information on any particular job quicker than by other time accounting procedures. Periodically the cards are all sorted into piles according to the job number and these jobs are then posted to a job sheet in a master record book. Posting done this way as a mass entry is much more quickly accomplished than by daily postings. Furthermore, all important information about the operational side of the business is right at hand. Machine loadings and percentage of time idle are easily and quickly determined. Overtime payroll information can be coded and thus simplify job invoicing.

The object of the Boeckeler time cards is to give the tool shop operator a superior and simplified system of operational accounting comparable to double entry bookkeeping for dollar accounting. All the important data is cataloged on the face of the cards. The edge-punched coding around the margin makes this information immediately available. Various other accounting methods, and combinations of methods, can accomplish many of the same results as the Boeckeler system; but his experience has been that none can do it as cheaply or as quickly or as completely.

The cards are edge-clipped by the hand punch each morning by the shop operator; this operation takes about 20 seconds per card. Nothing further has to be done to the cards, as they are in usable form as soon as this edge-clipping has been done.

From actual experience, it has been proven that by using this daily method of keeping the shop's time records the expense for this necessary paper work can be cut to a minimum. Plus the added advantage of having all vital information readily available for use whenever it is needed. In this way the tool shop operator is in constant touch with every phase of his shop's operation, an advantage which is bound to pay dividends.



Six of the Bliss Inclinables producing the variety of parts for the Rexair Cleaner and Conditioner. All new equipment is Bliss-built.

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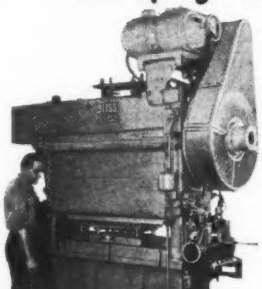

All the motor laminations used by Rexair are produced on this #645-D Bliss High Production Press.

Ten Bliss Inclinable presses and a Bliss High Production press equipped the Rexair Division of Martin-Parry Corporation to meet all stamping requirements on a high-volume, low-cost manufacturing basis. Die cushions were built into several presses to accommodate necessary drawing operations and to give Rexair greater versatility in its press room.

"Since the Bliss presses started operating about two years ago, we've never had a minute's production loss," says Les Johnson, Rexair's plant superintendent. The High Production press delivers an average of 8,600 perfect laminations per hour, running well within its capacity.

Bliss-Marquette Die Cushions are credited by Don Crane, press department foreman, for part of the long die life on the Inclinables producing separators, water pan bottoms and inspection plates. The pneumatic cushions exert a constant pressure throughout the entire stroke, and are used for drawing work that would not be possible with spring cushions, while at the same time eliminating the excessive pressures which cause wear and tear on dies.

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Separator—18-gauge aluminum, 4¼" dia., 1¼" drawn and formed—514 per hour.

Fan Shroud (left)—24-gauge aluminum, 5½" dia., 1" drawn and formed—751 per hour.

Eddy Plate (right)—24-gauge aluminum, 5½" dia., 1" drawn and formed—751 per hour.

Motor Laminations—.018 steel, 2" dia., 3¾" dia., average 8,600 hourly production with progressive die.

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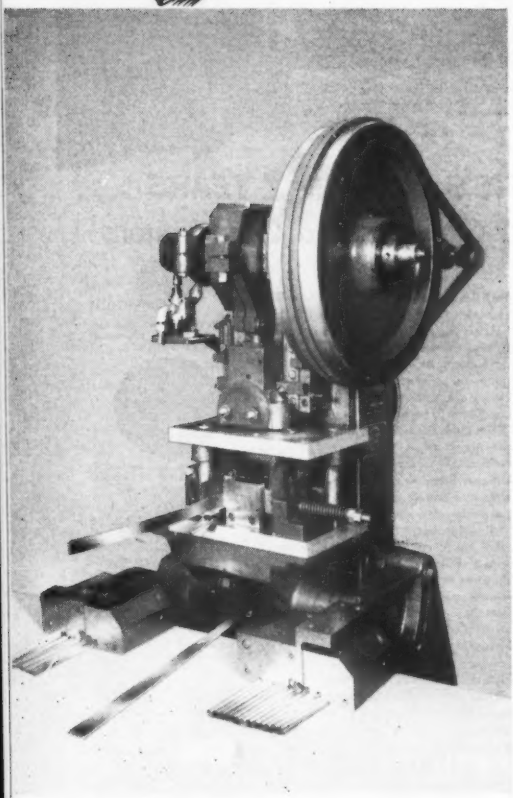

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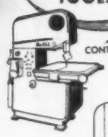
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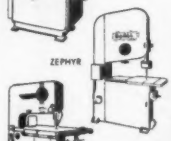
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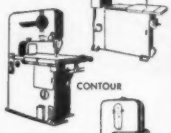
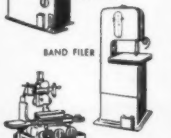
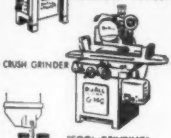
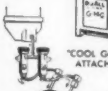
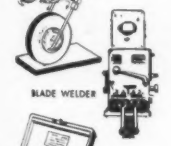

CONTOUR


BAND FILER

TOOLROOM GRINDER


CRUSH GRINDER


"COOL GRINDING" ATTACHMENT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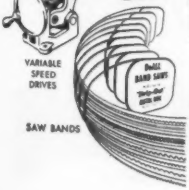
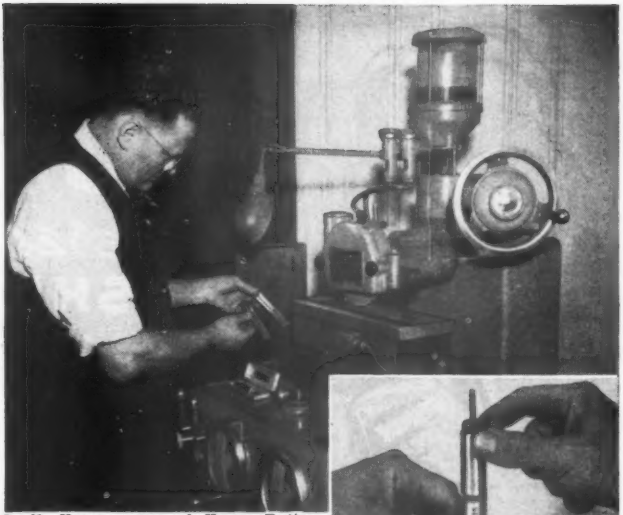

SAW BANDS



G. N. Krouse, owner of Krouse Testing Machine Co., Columbus, Ohio, inspecting 5" micrometer scales after "Cool Grinding" on DoAll Model G-1 Surface Grinder. These scales with .001" taper from end to end are held to accuracy of .00002" (20 millionths of an inch). Their micrometers and scales are used to measure plating thickness.

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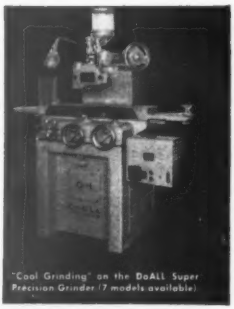
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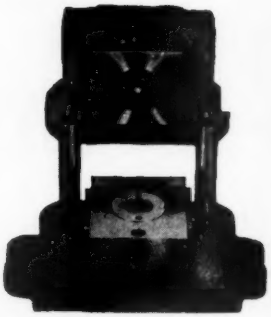

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. . . from page 76

These cavities fill up with molten alloy and the shrinkage between the resultant solidified bosses or lugs then tends to adhere the runner onto the ejector die half, thus helping the runner to pull away from the stationary die half.

Sprue to Runner Design in the Case of the Horizontal Cold Chamber Machine

In the case of dies to be operated in the cold chamber, horizontal type die casting machine (wherein the injection chamber is in the horizontal position), when the molten alloy is ladled into this chamber it immediately flows along the bottom, Figure 29A. Therefore, if the runner is positioned in such a fashion that it opens directly into the bottom side of the injection chamber, the molten alloy will flow into the runner opening, Figure 29B, whereupon it may partially or wholly solidify before the injection ram completes its forward stroke and forces the metal under pressure through the runner and hence to the main die cavity. Metal which thus solidifies in an improperly positioned runner obstructs the free flow of the main mass of molten metal through the runner, thus preventing the proper filling of the die cavity to which the runner leads. For this reason, runners cut in dies to be operated on the horizontal, cold chamber type die casting machine are designed so that they join the sprue on the topside only, Figure 30. This of course, places a serious restriction on the design of the runner systems for multiple cavity dies that are to be operated on the horizontal type machine. This is because the runners which lead to cavities situated in the die below the horizontal center line of the injection chamber cannot lead straight from the injection chamber to their respective die cavities, but must curve upwards and partly around the sprue so that they open into the sprue from the top, Figure 31. It has been because of this particular restriction that the horizontal cold chamber type machine is designed in such a way that the injection chamber passes through the stationary

(Continued on page 110)

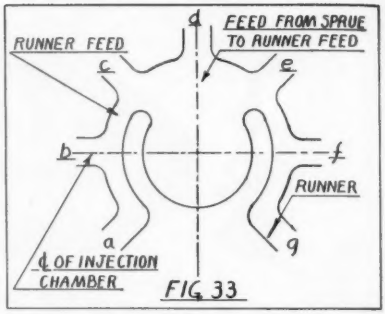


Fig. 33. Sketch showing a typical runner system design for a multiple cavity die wherein all of the individual cavities are situated about the sprue in circular fashion. Note that the sprue joins the runner system at a point above the horizontal center line of the sprue.

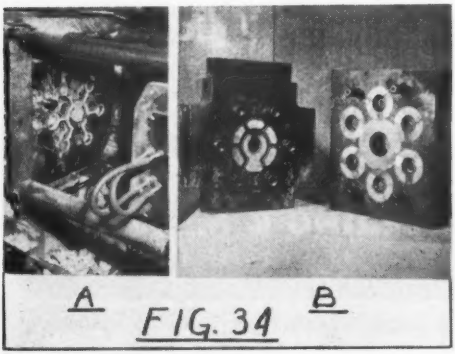
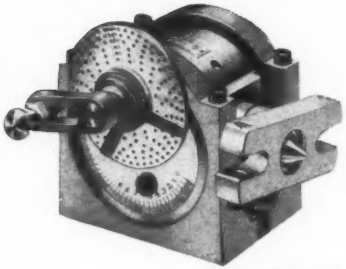


Fig. 34A. Photograph of a die casting die, with the unejected spray clinging to the stationary die half, and with a runner system designed like that shown in Fig. 33.

Fig. 34B. Same die as shown in Fig. 34A. Here it is shown without the spray. Note how the individual die cavities are sprayed regularly about the sprue.



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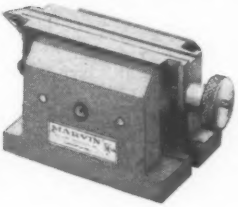

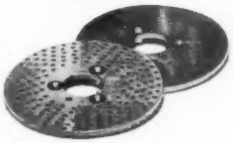

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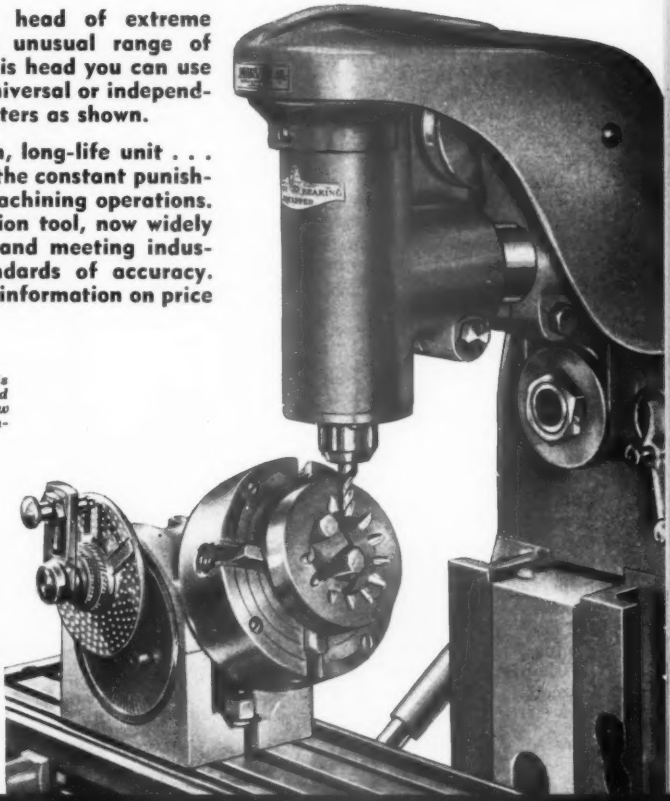

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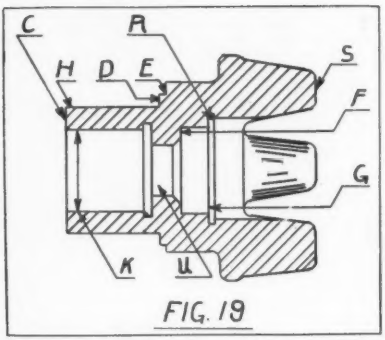


Fig. 19. Counterbores F and G, generated by a step counterboring tool in the second chucking are checked for depth from the end of the stud by use of a gaging fixture and plug gages.

To determine the uniformity of the wall thickness, T, Figure 17, a concentricity test is made between the outside diameter H and the inside diameter of hole K. Because this is a machined part and not ground, the inspector makes a setup composed of V-block, surface gage and test indicator. The spider is placed in the V of the V-block with it resting on the surface of diameter H. The test indicator is clamped to the surface gage column in such a position that the contact point can touch the outside and inside diameters. As the spider is manually revolved, the indicator registers any variations that are present. Since the tolerance for this operation is .005", any piece not meeting this tolerance goes back to the shop for correction before it is approved by the inspector. This approval must be had before the next operation can be performed.

Upon completion of the second operation, diameters and depths of counterbores F and G, Figure 19, are to be checked. Because no excess material remains for making alterations, careful inspection is necesary at this point. A checking fixture has been found to be the most reliable for this inspection. The gaging fixture designed for this purpose is shown in Figure 20. The inside diameters of counterbores F and G are checked with plug gages, but the depth of them from the ends of the studs and their relation to surface D, Figure 19, are critical dimensions with a .033" allowable tolerance.

The spider is set in the fixture with surface D resting on surface "b" of the fixture and member "a" protruding through the hole U. Plug "c", Figure 20, which fits over "a" and seats on surface F, has a height equal to the specified dimension to the top of the studs S, Figure 19, the checking point. Gage "d" is used in a similar manner to check the depth of surface G from the end of the studs.

During the first chucking of the spider, the machining was performed on the hub end; and on the stud end during the second chucking. The diameters and surfaces developed in these two sets of operations must be concentric and square in relation to each other. This is determined with the V-block, surface gage and test indicator method previously described. This inspection must be carefully performed because the next operation is grinding these diameters, and with approximately only .015" of stock left there is not much metal left for finish grinding them.

The next operation is a preliminary grinding in preparation for finish grinding diameter H and faces D and C, Figure 19. The same fixture, Figure 20, is used to check the finish ground dimension from D to F, and from D to G; and a

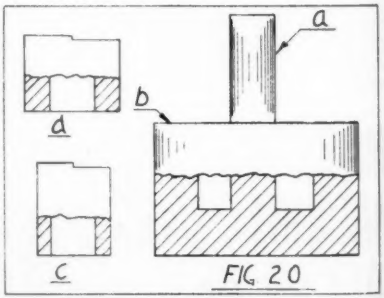
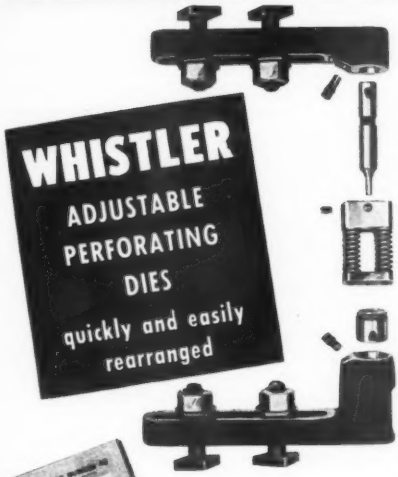


Fig. 20. Gaging fixture and plugs used in inspecting counterbore depths F and G, Fig. 19.

Meet sudden change-orders without tying up Press Production



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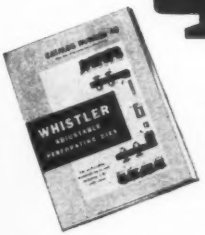

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depth micrometer is used to check the dimension from C to D. Concentricity is again checked by the V-block, surface gage and test dial method to a tolerance of .003" instead of .005". Squareness of the faces C and D with diameters H and K is checked to insure perfect alignment by clamping the part in a V-block that is perfectly square and standing it on end so that the different faces can be checked by surface gage and indicator. Tolerances of .002" must be held. This is a very exacting inspection because permission to proceed to the next operation depends on its approval.

Inspecting the results of the most important operation, turning the studs, now follows. This is an important operation because the tolerances are very close. The basic stud bolt circle must be concentric with other diameters of the part and its diameter must be held to .002" tolerance. The studs must be equally spaced and they must be parallel. The stud snap ring grooves must be held to .004" tolerance in their dimension from the stud base, and their diameters held to .004" tolerance. After the groves are cut, no more work is to be done on them and for this reason must be checked carefully so that they will be correct after subsequent machining has ben done on other parts of the forging.

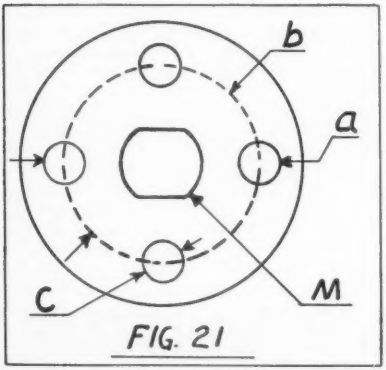

Fig. 21. Sketch showing diameters a and c which are measured by micrometers to determine if the stud bolt circle, b, is within the allowable tolerance.

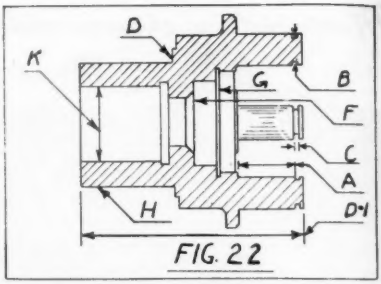

Fig. 22. Snap ring groove dimensions A, B and C are carefully checked because no further work is done on the grooves to permit any corrections.

The inspection procedure covering these operations is as follows: The stud diameters, "c", Figure 21, and the basic stud bolt circle, "b", are checked with micrometers. Since the specified diameter of each stud is $\frac{.5002"}{.4999}$ and the bolt circle, "b", is $\frac{2.3135"}{2.3115}$, the maximum micrometer reading allowable would be 2.8137" and the minimum, 2.8114", as indicated in Figure 21.

Verifying the concentricity, parallelism and squareness of the studs with the rest of the part is done with the V-block, surface gage and test indicator setup. The part is placed in the V-block with it resting on the ground diameter H, Figure 22. As the part is revolved, the test indicator contacts the studs near the snap ring grooves. The indicator is then moved to the base of the studs and the part revolved again. The difference between these two sets of indicator readings should not be greater than .003".

Equal spacing of the studs is determined with the same V-block setup shown schematically in Figure 23. A gage block of appropriate height is placed under one stud and an indicator reading is taken on a stud as shown. The spider is revolved until the next stud rests on the gage block and an indicator reading is taken on the stud that comes into position. This operation is repeated for all four studs. The differ-

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Model J

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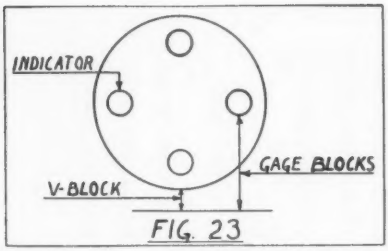

Fig. 23. A schematic view of the setup using V-block, indicator and gage blocks to determine equal spacing of the studs.

ance between these four readings should not be more than .003". If the readings differ more than .003", it indicates that studs are not equally spaced.

The width of the snap ring groove C, Figure 22, is gaged with a thickness gage and its diameter B, with a snap gage. A special cylindrical gage, Figure 24, with a step, equal to the tolerance, machined on one end is employed to gage the dimension, A, Figure 22, from the groove to the base of the stud. The gage is placed over the stud and the height can be sighted to determine whether the dimension is within tolerance.

A special plug gage is used to check the broached hole M, Figure 21.

Specifications require that the heat treating on this part must be performed by a heat treating company approved by the government. The studs have to be hardened to Rockwell C48-53 and the spline end drawn to C-32. The inspection of the spiders after heat treating is carried out over the same procedures as those followed when they first came from the forge shop.

At this point the studs are again checked to determine whether they have maintained their position and that they did not spring to such a degree that they could not be cleaned up in the following grinding operations.

The inspection procedures from now on check the finishing operations; therefore, .0001" reading indicators, Sheffield "shadow graph" and Webber "micro gage blocks" are used to insure the required accuracy.

The finish grinding of hub H, Figure 22, has to be held to .005" tolerance. This is checked by arranging gage blocks on the shadow graph anvil equal to the specified diameter. The shadow graph is then set so that when the spindle contacts the gage blocks, the reading on the scale is zero. The gage blocks are removed from the anvil and the hub of the spider inserted under the spindle. Any variation in the hub diameter from that specified will register on the shadow graph scale in ten-thousandths of an inch. By moving the spider from left to right under the spindle, taper in the part is determined, which must be held under .0002".

Inside diameters K, F and G, Figure 22, are again ground with .005" allowable tolerance and are checked with plug gages. Concentricity checks are again made by the same method previously described.

Cutting the splines in the bored hole, K, Figure 22, is the next operation and is inspected with a special spline gage. This gage is a plug gage with splines cut to the specified dimensions. Because all diameters and surfaces have to be concentric and square with the splines, a special spline arbor, designed to revolve between centers, is used for this inspection. The spline arbor is inserted into the splines of the part, mounted between the centers, and indicator readings are taken on the required surfaces and diameters as the part is revolved. A part showing more than a .002" read-

(Continued on page 116)

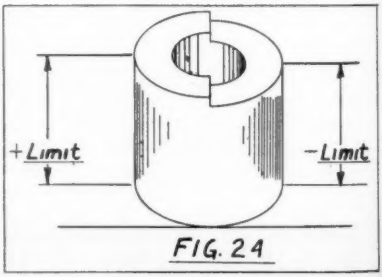

Fig. 24. A special cylindrical gage with a step, equal to the tolerance, is employed to gage the dimension from the snap ring groove to the base of the stud, A, Figure 22.

JIG GRINDING ACCURACY *guaranteed** with the *Vulcanaire* ATTACHMENT 65,000 R. P. M.

It's built by toolmakers for toolmakers

YOU CAN Place it quickly in the spindle of your jig borer or mill and locate—finish grind holes in hardened steel to "tenths" at speeds controlled at any point from 30,000 to 65,000 R. P. M.

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- √ move location of holes in hardened steel blocks.
- √ jig grind interchangeable holes in hardened sections.
- √ grind .032 to ⅛" holes with diamond impregnated laps.
- √ grind contours and relief with tungsten carbide burrs.
- √ grind radii in die sections.
- √ jig grind awkwardly shaped components.
- √ eliminate jig bushings in tools where close spacing is essential.
- √ reduce die making time because the jig ground hardened die, stripper plate, and die holder all fit together creating uniform clearance.
- √ jig grind holes from smallest up to 1½" with 10,000 series, and holes from 1½" up to 4" with 20,000 series Vulcanaire.

EASY DOES IT

The system can be used between machines of various capacities.

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- √ and without adding manpower.

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QUICK-PIC

CUTTING TOOLS

The current Nelco carbide-tipped tool catalog is a loose-leaf booklet of sizes, prices, photographs and other pertinent information.
Circle No. E1.

AIR FEED

Actual case histories are a feature of a new circular describing the economical "Feedmaster" unit of Great Weste[illegible]ools, Inc.
Circle No. E2.

SURFACE GRINDING

The wide range of form work on defense jobs that can be done on Mattison grinders is shown in a new, all-illustrated Mattison Machine booklet.
Circle No. E3.

CHROME PLATING

"Chromaster," a self-contained, compact plating unit, is described in a four-page bulletin from Ward Leonard Electric Company.
Circle No. E4.

CONTOUR GRINDER

Here's a folder on a Grant belt grinder for simple or complex grinding of concave, convex parts or radii, deburring, and many other jobs.
Circle No. E5.

CONTRACT SHOP

This highly illustrated catalog describes extensive facilities and products of The Steel Products Engineering Co. Twenty-four attractive pages.
Circle No. E6.

COUPLING

Anchor Cut-Out Couplings combine torque sensitive protection with features of a flexible coupling. Catalog 50A tells the story.
Circle No. E7.

JIG & FIXTURE PARTS

Over 80 pages of valuable template drawings can be found in the current catalog of Jergens Tool Specialty Co.
Circle No. E8.

VISE

Cardinal Bulletin No. 24 details features of the Speed Vise which is literally "one hundred jigs in one." Four pages.
Circle No. E9.

COUNTERBORES

Counterbores, countersinks and core drills are described as to size, price, etc. in an eight-page Scully-Jones bulletin.
Circle No. E10.

AIR GRINDERS

M-B Products' new general catalog covers a complete line of pneumatic tools and equipment. Air line filters are included.
Circle No. E11.

DRILL BUSHINGS

Easy-to-use data on several types of bushings can be found in the latest American Drill Bushing Company, Inc., catalog.
Circle No. E12.

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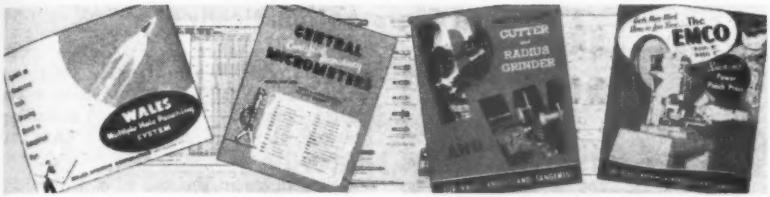


HOLE PUNCHING

Attractive Brochure M fully illustrates and describes the Wales Multiple Hole Punching System. It comprises eight interesting pages.
Circle No. E13.

MICROMETERS

New Read-Rite Micrometers are included in the complete line shown in Central Tool's comprehensive, 12-page Catalog 30.
Circle No. E14.

CUTTER & RADIUS GRINDER

A detailed description of this versatile Pratt & Whitney machine is contained in new Circular No. S455-5. It's fully illustrated.
Circle No. E15.

PUNCH PRESSES

Features and specifications of the cost-cutting "Emco" presses are contained in a colorful bulletin of of Klaas Machine & Mfg. Co.
Circle No. E16.

DIE CASTINGS

"What is the limit to the size and weight of a die casting?" This question is answered in an interesting new Doehler-Jarvis Corp. folder.
Circle No. E17.

AIR DEVICES

Bellows Bulletin CL-30 is a brief but informative review of the company's entire line of "Controlled-Air-Power" Devices. Makes good reading.
Circle No. E18.

ABRASIVES

Here's a convenient, condensed catalog on Bay State Abrasive's complete line of grinding wheels of all types, and other products. Has 32 pages.
Circle No. E19.

HYDRAULIC PRESSES

Illustrated here is one of the continuing series of interesting booklets published by Denison. To get on the mailing list,
Circle No. E20.

ABRASIVE BELTS

Behr-Manning Corp. offers an interesting bulletin, issued several times a year, on the advantages of abrasive belt grinding.
Circle No. E21.

CENTERS

Regular ball bearing centers for production and toolroom use are described in Ready Tool Company's current Bulletin No. 483-R.
Circle No. E22.

CASTING

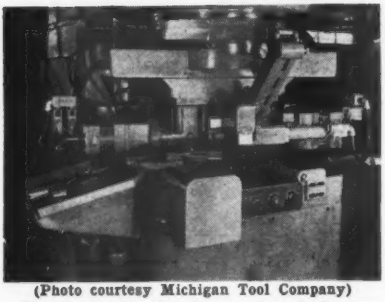
Many precision casting applications are detailed in a unique folder called "File on Microcasting Case Histories." Well illustrated.
Circle No. E23.

ANCHOR BUSHINGS

This cost-reducing type of bushing is the subject of a 12-page catalog available from the manufacturer, The Hi-Shear Rivet Tool Co.
Circle No. E24.

SEE ADVERTISERS INDEX, PAGE 103, FOR KEY NUMBERS

Unloading Gears Automatically



(Photo courtesy Michigan Tool Company)

In line with the increasing industry-wide interest in "automation," a new, low-cost, universal, self-contained, automatic unloading attachment has been devised for rotary gear shaving machines. It is especially adaptable to unloading of small gears when automatic loading is employed. Use of the attachment cuts costs by reducing operator fatigue and permitting one operator to service more machines.

A typical application of the unloader is shown in the illustration; guards have been removed from the machine for clarity. The unloader consists of a small wire-mesh belt which travels over two drums. Drive is from a low-horsepower electric motor; slots in one mounting bracket allow adjustment to take up slack in the belt.

Advantages in the use of a wire-mesh belt are:

1. Since the belt moves at a relatively low constant speed, it permits cutting fluids to drain back into the machine before the gear is discharged into the collecting pan;

2. The belt has a certain amount of give which prevents damage to the finished gear either from striking a conventional metal chute or another gear; (Metal in the belt is softer than the gears.)

3. Long life expectancy of the belt; freedom from damage from cutting fluid.

The loader can be quickly attached to the gear shaver in any of several positions. No changes in the machine are necessary except to drill and tap a few holes for mounting brackets and the discharge chute.

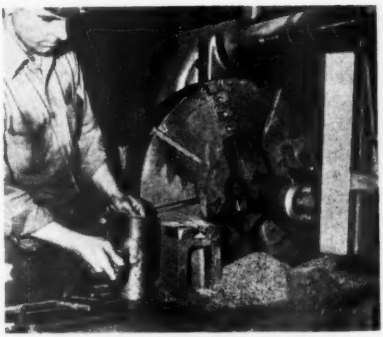
★ ★ ★

Simultaneous Turning and Boring with Standard Cardide Blanks

Here is a simple but ingenious setup where virtually standard carbide tools cut costs and increased output considerably. Two operations, turning and boring, are done simultaneously to machine both inside and outside surfaces of the sleeve shown in the photo.

The part, a liner, is made of extremely close-grained centrifugally cast iron. Tools use standard carbide blanks, of cast iron cutting grade. A speed of 140 sfm at a feed of .018″ is used for the ¼″ roughing cuts and 189 sfm at .020″ feed for the .015″ to .030″ finishing cuts.

Since tool life is extremely long, tool cost on this highly-productive setup is also very low.



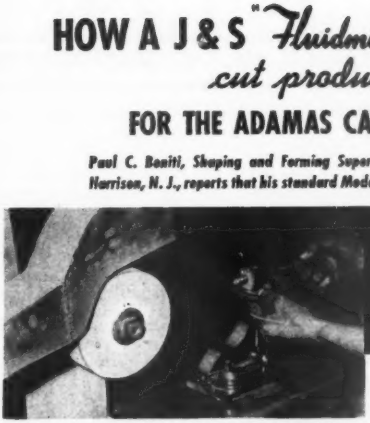
(Photo courtesy Carboloy Co., Inc.)

★ ★ ★

More than 8000 salaried and hourly personnel have attended one or more of Ford Motor Company's special training courses in statistical quality control. Their vendor contact QC program, involving incoming materials, has resulted in the training of 587 representatives from 172 of Ford's major suppliers.

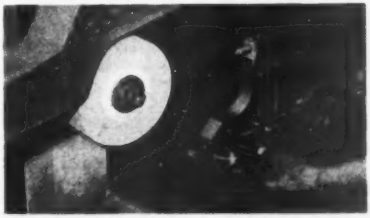
HOW A J & S "*Fluidmotion*" WHEEL DRESSER *cut production costs* FOR THE ADAMAS CARBIDE CORPORATION

Paul C. Boniti, Shaping and Forming Supervisor of the Adamas Carbide Corporation, Harrison, N. J., reports that his standard Model "E" J & S "Fluidmotion" Wheel Dresser has



- Cut set-up time
- Cut dressing time
  (save on diamond and wheels)
- Cut maintenance cost
  In 4½ years grinding presintered carbide, has cost $17.50 to maintain — less than $4.00 per year.

1 To set-up for convex radius, first mike distance from diamond point to micrometer plate, then add radius desired. (For concave radius, subtract).



2 Slide dresser in dust-proof channel till mike slips over pins as shown and lock with socket wrench. Dresser is now ready for action.

3 Bring diamond point up to center line of wheel, rotate dresser on swivel base in one continuous motion. A clean, accurate radius results! No chatter marks.

OTHER "Machine Shop TIME SAVERS" by J & S

J & S "All-Purpose" Jaw Clamps, KOALA Circular Cutting Tool, "Down-Hold" Vise Jaws, and "Attachable" Parallels. Write for "Time Savers" Booklet.

HOW "Fluidmotion" saves time is demonstrated at left. Photos taken at Adamas Carbide show how a concave or convex radius—accurate to .0001" can be obtained in three **simple** steps.

Dressing two angles **tangent** to a radius **is simple.** Only one more step is necessary. After radius is set (steps 1 and 2) the dresser is swung on its graduated base to first one angle, then the other, and both are locked in with a turn of the knurled knob. Actual dressing is again accomplished in **one continuous motion—it is not necessary to move the dresser on dove tails to form the angles.**

It is **important** in our work to have a rigid dresser that can dress a wheel **true consistently,** leave no chatter marks, **and still not have the abrasive content in the presintered material affect the accuracy of the dresser.** This I can personally vouch for. J & S "Fluidmotion" in **4½ years** has passed this test. I have complete confidence in "Fluidmotion"—no trial and error in order to obtain accurate forms. Our company has enjoyed the lower production cost made possible by "Fluidmotion's" repeated accuracy and ruggedness. It's a **cinch** to do our grinding jobs.

Adamas Carbide, well known for its **high quality, low cost carbide blanks,** attributes a fair share of its success in attaining more efficient production to its J & S "Fluidmotion" Wheel Dresser.

You, too, can also cut production costs by employing the J & S "Fluidmotion" Dresser in your tool room.

Application to any **surface or cylindrical grinder** is quick, simple. Set-up and dressing time is **yet** the lowest to be found.

Wheel Dressers made to dress wheels accurately up to 36" in diameter, and designed to meet your grinding requirements.

"Reg. U. S. Pat. Off. *For details, write to:*

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475 Main Street, East Orange, N. J.
Representatives in Principal Cities

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PUBLICATION

Keep Informed! CATALOGS • BULLETINS • SPECIFICATIONS

Hardinge-Sjogren Speed Collet Chucks, for toolroom lathes, engine lathes and grinders, are the subject of informative new Bulletin No. 8. It contains engineering specifications with full illustrations of each type of chuck for threaded nose spindles, cam lock spindles and American Standard spindles. HARDINGE BROS., INC., Dept. TDJ, Elmira, N. Y.

Inform-A-Gram No. B1.

The Automatic Electric Metal Marking Typewriter is a labor-saving device for the detail marking of name plates. It is all-electric, with automatic table feed. Cadillac Stamp Co. will provide detailed literature.

Inform-A-Gram No. B2.

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Com-Port Power Tool. A specially designed shear head can be attached to the basic Com-Port Power Unit to make a compact, portable tool for bending, punching, forming, pressing studs, rivet squeezing, etc. All Com-Port Power Tools are ready for instant use by merely coupling the power unit to an 80 psi shop air pressure line. An illustrated bulletin has been released by the manufacturer, SNELLER MACHINE & TOOL CO., INC., 15002 Woodworth Ave., Cleveland 10, Ohio.

Inform-A-Gram No. B3.

"Hotform" Die Steel assures maximum die life and can be relied upon not to crack or show movement in heat treating even in large and complex shapes. Detailed application literature has been released by Vanadium-Alloys Steel Co.

Inform-A-Gram No. B4.

T-J Cylinders are designed for a wide range of pushing, pulling, lifting, clamping or control jobs, 100 lbs. or 50,000 lbs. Complete descriptive literature is offered by The Tomkins-Johnson Co.

Inform-A-Gram No. B5.

Kasson Precision Collets and attachments are presented in detailed literature from General Die & Stamping Co. The "Klutch-Kollet," an accurate step collet for chucking to 2¾" diameter, is featured.

Inform-A-Gram No. B6.

Hamilton No. 00 Gear Hobber is the machine featured in Bulletin No. H-00-49, which contains full information on small, precision spur gear hobbing.

Inform-A-Gram No. B7.

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PREVIEWS

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Cold Drawn Steels and Drill Rods are described in a pocket-size, 48-page catalog issued by Pittsburgh Tool Steel Wire Co. Complete technical and price data are included, and a special section is devoted to heat treating recommendations. Write for this informative catalog, No. 5, to PITTSBURGH TOOL STEEL WIRE CO., Dept. TDJ, Monaca, Pa.
Inform-A-Gram No. B8.

The Air Master Dust Collector will keep dust and grit out of your plant. It instantly sucks dust particles from the whirling wheels of grinders and buffers. The manufacturer, Cincinnati Electrical Tool Co., will provide descriptive literature.
Inform-A-Gram No. B9.

The Schaublin SV Turret Lathe is designed for bar or chuck work. Height of centers is 2.8". Distance between headstock and turret carriage is 8". Complete information and literature are obtainable from Schaublin Div., Carl Hirschmann Co.
Inform-A-Gram No. B10.

The Magna-Sine provides positive accuracy for any angular setup, whether single or compound. The current Magna-Sine catalog is being mailed by the manufacturer, Omer E. Robbins Co.
Inform-A-Gram No. B11.

A 7" Precision Metal Shaper is presented in Delta Bulletin AD-615. Complete specifications, catalog listings and illustrations of the features are given. A portable cabinet is also described.
Inform-A-Gram No. B12.

A Heavy Duty Spiral Milling Attachment has been introduced by The Cincinnati Milling Machine Co. It is designed for the larger, more powerful Cincinnati milling machines, from No. 3 Dial Type to No. 6 Dual Power Type. Publication No. M-1715 contains specifications and other information. THE CINCINNATI MILLING MACHINE CO., Dept. TDJ, Cincinnati 9, Ohio.
Inform-A-Gram No. B13.

Furnace Catalog. Featured in this publication is the Johnson 706 Hardening, Tempering and Annealing Furnace, which allows you to select any temperature from 300° to 1875 F. It provides clean, uniform heat at low cost.
Inform-A-Gram No. B14.

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FILES...SAWS...STONES
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An accurate, smoothly-operating machine that files, saws and stones the most intricate die shapes... eliminates tedious hand operations...reduces costs. It is quality-built for long, trouble-free service ... hardened and ground shafts running in bronze bushings minimize wear. The holding chuck and clamping device provide perfect file alignment.
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PUBLICATION PREVIEWS

Automatic Two-Stage, Three-Operation Drawing Presses made by Verson produce over 1200 shells per hour. Other typical production figures obtained with Verson presses are detailed in new literature.
Inform-A-Gram No. B15.

Flexolap is instantly and accurately adjustable for fast cutting and polishing without danger of galling or seizing. Complete particulars are contained in a Federal Tool Corp. brochure.
Inform-A-Gram No. B16.

Model A "RFC" Roll Feed is suitable for four-ton, six-ton and eight-ton power presses. It cannot slip and it reverses instantly. Literature on the complete "RFC" line of precision feeds may be had from Roll-Feeds Corp.
Inform-A-Gram No. B17.

"Friction Sawing" is an informative booklet issued by The Tannewitz Works. It enumerates the time-saving advantages of friction sawing with Tannewitz High Speed Band Saws.
Inform-A-Gram No. B18.

The Moore Panto-Crush Wheel Dresser combines crush-forming and diamond dressing. Either method is immediately available. Switching from one to another disturbs neither the work nor the location of either truing device with respect to the wheel or workpiece. Literature describing this device in detail is offered by Moore Special Tool Co., Inc.
Inform-A-Gram No. B19.

The Milwaukee Profile Grinder is available in two models, "Standard" for mounted stone wheels, and "High Speed" for diamond or carbide wheels. Rice Pump & Machine Co. offers illustrated literature on this grinder.
Inform-A-Gram No. B20.

Cincinnati Shears are pictured and described in attractive, 32-page Catalog S-5. Standard features and special equipment are discussed, and dimensions are listed.
Inform-A-Gram No. B21.

"Fascut" End Mills, a complete line that includes the popular three-fluted mill, are described in current literature offered by Arrow Tool & Reamer Co.
Inform-A-Gram No. B22.

All Standard Colonial Drill Jig Bushings are now made with Colonial No. 3, a more wear-resistant bushing steel. Complete details are available.
Inform-A-Gram No. B23.

Producto Die Sets are described in a comprehensive, 72-page catalog. A new format provides color tabs for each section for easy identification.
Inform-A-Gram No. B24.

Dykem Steel Blue increases efficiency and accuracy in the making of dies and templates. Full information may be had from the manufacturer.
Inform-A-Gram No. B25.

NEW, IMPROVED **NU-MATIC**

THE WHEEL WITH THE PNEUMATIC DRUM

With this Nu-Matic wheel the abrasive belt rides on a cushion of air contained in a rubber drum. Different pressures in the drum and different grits provide varied surface finishes. Deflate, and belts can be changed easily and quickly for grinding, sanding or polishing. Cut your labor, production and inventory costs with Nu-Matic grinding units. Adapters for ⅝"-11 or ½"-13 power equipment. (Specify size.)

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Detroit 21, Michigan UNiversity 3-2573

PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION

Riehle Screw Power Universal Testing Machines and accessories are featured in a new 30-page catalog. Included are illustrations, details of construction, specifications and dimensions of testing machines up through 400,000 lbs. capacity. RIEHLE TESTING MACHINES DIV., American Machine & Metals, Inc., Dept. TDJ, East Moline, Ill.
Inform-A-Gram No. B26.

Benchmaster's Milling Machine is a low-cost unit that mills horizontally and vertically; also drills, grinds and turns. New literature has been prepared.
Inform-A-Gram No. B27.

"Step Up Production" is Minnesota Mining & Mfg. Company's new 36-page booklet that shows how belt grinding cuts costs. This publication is packed with excellent illustrations.
Inform-A-Gram No. B28.

The "Kwik-Switch" Tool Holder of Universal Engineering Co. permits 10-second tool changes without accuracy losses. Literature provides complete data.
Inform-A-Gram No. B29.

Roll Forming Machines and Roller Dies are featured in the line of Maplewood Machinery Co., of Chicago. Complete literature is now being distributed.
Inform-A-Gram No. B30.

The Adjustable Rod Guard for power presses is among the complete line of press guards shown in the current catalog of Humm Safety Equipment Co.
Inform-A-Gram No. B31.

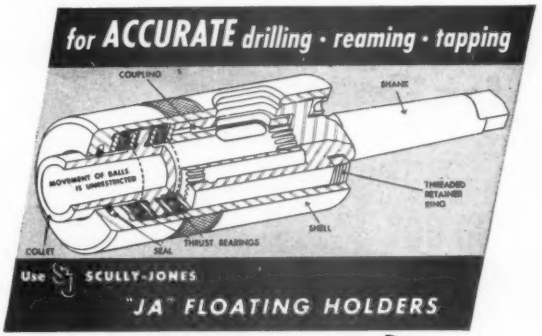
The J & S "Fluidmotion" Wheel Dresser is described and pictured in a current folder. This dresser is applicable to any surface or cylindrical grinder.
Inform-A-Gram No. B32.

Wittek Roll Feeds, made in standard models to meet every requirement in the automatic feeding of strip stock to punch presses or press brakes, are pictured and described in a current brochure. Their companion units, Wittek Adjustable Reel Stands, are also covered.
Inform-A-Gram No. B33.

Sutton Collets feature diamond grip that stops slipping. The current Sutton Collet and Feeder Catalog is offered to TDJ readers.
Inform-A-Gram No. B34.

Spectrum Diamond Lapping Compound is featured in current literature. Twelve colored standard grit sizes are fully described, and applications are listed. PENN SCIENTIFIC PRODUCTS CO., 5941 Alma St., Philadelphia 24, Pa.
Inform-A-Gram No. B35.

"Superear" Stop-Pins and Finger Stops are time- and money-saving items available from Twentieth Century Mfg. Co. in several sizes. Literature is obtainable.
Inform-A-Gram No. B36.

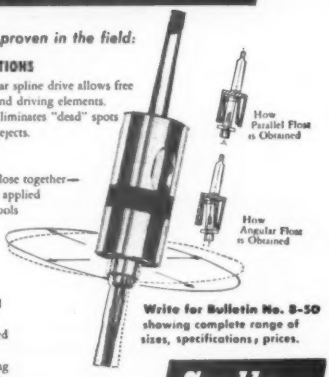


Get these advantages... *proven in the field:*

UNIFORM CUTTING OPERATIONS
Clearance in the double-gear spline drive allows free movement of the floating and driving elements. This prevents binding and eliminates "dead" spots or zones which often cause rejects.

CONTINUOUS PRODUCTION
Two thrust bearings—placed close together—minimize the effect of the force applied on the tool by the hole. Thus, tools float freely into alignment—reducing down time and damage to cutting tools.

TROUBLE-FREE OPERATION
Balls are free to move in the required direction or rotate around the collet, because the floating element is separated from the drive. Free movement of the balls eliminates confined reciprocating motion. This greatly reduces the scrubbing action characteristic of small rocking movements. The scrubbing action often causes rapid destruction of ball-thrust plates and prevents free float.



Write for Bulletin No. B-50 showing complete range of sizes, specifications, prices.

Scully-Jones

1913 S. ROCKWELL ST., CHICAGO 8, ILLINOIS

6457TD

YOU GET LOW COST, FAST, ACCURATE PRODUCTION WITH OUR STANDARD AND SPECIAL TOOLS

SEE ADVERTISERS INDEX, PAGE 103, FOR KEY NUMBERS

PUBLICATION PREVIEWS

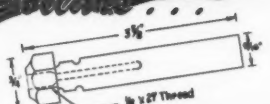
High Speed's Staking Machine can handle any job of staking or riveting fixed or movable joints; anything in eyeletting, grommeting, burring, pointing with platinum, tungsten or silver. Full details may be secured from High Speed Hammer Co., Inc.
Inform-A-Gram No. B37.

The Erickson Precision Collet Chuck permits drill stubbing, reduces downtime and drill breakage, and holds hole sizes. Full details are given in Catalog C-2.
Inform-A-Gram No. B38.

The New "Tangi-Matic" Dresser has been developed by Perfex Gage & Tool Co. for the speedy dressing of any grinding wheel form with precision to "tenths." Descriptive literature has been prepared.
Inform-A-Gram No. B39.

The Sheldon Precision Lathe Catalog covers design and operation features that permit the Sheldon Lathe to handle the great bulk of everyday toolroom and die shop jobs.
Inform-A-Gram No. B40.

How to trade *Pennies* for *Dollars* . . .



10c more (per gallon) invested in cutting fluids SAVES $50 PER DAY PER MACHINE!

PRICE alone makes no profit. The drawing above illustrates a shackle bolt which is drilled and tapped on a New Britain Automatic. Using an inferior cutting oil 12 taps were used up every 2½ days—12 pieces per tap. A change to Stuart's SPEEDKUT M on a 2½ day run showed 530 pieces per tap—no taps used up. The saving? Taking into full account the pennies—higher price of Stuart *quality* oil: $50 per day per machine!

If you are interested in a saving like this, ask to have a Stuart representative call. There is no obligation — we'll let Stuart performance do the selling.

D.A. Stuart Oil CO.

2729-37 S. Troy Street, Chicago 23, Illinois

Squaring Shear Bulletin. Eight-page, illustrated Bulletin No. 901 is devoted to Columbia's New Series Steel Squaring Steel line, recently improved an enlarged to include models for shearing mild steel plate from 3/16" to 1¼" thick. COLUMBIA MACHINERY & ENGINEERING CO., Dept. TDJ, Hamilton, Ohio.
Inform-A-Gram No. B41.

The Vulcanaire Jig Grinding Attachment can be used on your jig borer or mill to finish grind holes in hardened steel to "tenths" at speeds controlled at any point from 30,000 to 65,000 rpm. Literature describing the many applications of this attachment may be had from Vulcan Tool Co.
Inform-A-Gram No. B42.

Perkins Model No. 650 B Press. Improved features of this press are detailed in a new bulletin. These include tie rods shrunk in frame for extra rigidity; higher die space with greater depth of throat and larger bed area.
Inform-A-Gram No. B43.

"Protectron" senses minute increases in mechanical load and automatically "trips" machine before damage occurs. Details are contained in a bulletin offered by the manufacturer, The Brinnell Co.
Inform-A-Gram No. B44.

The Acro Die Set Puller Method is detailed in Bulletin 1250. This accurate, efficient method replaces old-fashioned systems that cause pinched fingers, scored pins and battered dies.
Inform-A-Gram No. B45.

"Cast-to-Shape Tool Steel" is a current Allegheny Ludlum booklet that gives full details on FCC Air Hardening, Oil Hardening and other cast-to-shape tool specialties.
Inform-A-Gram No. B46.

Ernst Hardness Tester. This patented, portable, direct reading metal hardness tester is featured in Bulletin ET-173. By just pressing the handgrips on the sides of this instrument, immediate, direct "at-the-job" readings are obtained of all types of metals. Pertinent illustrations are shown and also detailed principles of operation, advantages and applications. NEWAGE INTERNATIONAL, INC., 521 Fifth Ave., New York 17, N. Y.
Inform-A-Gram No. B47.

Sine Plates and Sine Bars are featured products in a current bulletin from Brand Tool & Supply Co. They are made of high grade alloy steel, properly heat treated and finish ground. Angle plates, inside micrometers, telescope gages and a knurling tool are also described as to price and features.
Inform-A-Gram No. B48.

Agitor Parts Cleaning Units are useful in the toolroom, in production and in the plant maintenance department. A catalog released by Graymills Corp. describes the three available sizes and their applications.
Inform-A-Gram No. B49.

The "Master Maker" of Fryer Tools & Instruments is covered in a new bulletin. Adaptable to all engraving machines, the "Master Maker" produces short runs and samples profitably, eliminates expensive rotary tables.
Inform-A-Gram No. B50.

The Heavy Duty Shoplifter now has new accessories that make it easy for one man to move heavy dies up to 2000 lbs. from storage rack to inclined bed of press. Economy Engineering Co. will provide literature.
Inform-A-Gram No. B51.

The Improved "Hardsteel" Drill of Black Drill Co. can be used to do accurate, smooth drilling, countersinking, counterboring and reaming in steels hardened by any process without first having to anneal the work. Write for "Hardsteel" Manual.
Inform-A-Gram No. B52.

Hovis Universal Washer Dies provide a master holder and by merely changing five small, easily removable parts the new washer or blank is produced. Hovis Screwlock Corp. will honor requests for literature.
Inform-A-Gram No. B53.

The Durant Stock Oiler prolongs the life of a die, eliminates hand oiling and saves production time. A variety of sizes is described in catalog sheet.
Inform-A-Gram No. B54.

Hardened and Ground HSS Blanks in any decimal diameter to ½", and in any length, are covered in Price list D-1.
Inform-A-Gram No. B55.

Pivot Punches are made of high speed steel and are whipsleeve supported. A detailed catalog is being distributed.
Inform-A-Gram No. B56.

YOU GET *BOTH* WITH

Zagar COLLETS and FIXTURES

Cut tooling costs! Whether parts are round, hex or square, Zagar collet fixtures save a world of time and money, turning losses into profits. Ideal for second operation work, since collet does not move lengthwise. Collet closing mechanism consists of hardened and ground collet bushing actuated by cams through movement of hand lever. All sliding parts are hardened and ground.

Ask for Catalog T-3.

ZAGAR TOOL, INC., 24000 Lakeland Blvd., Cleveland 23, O.

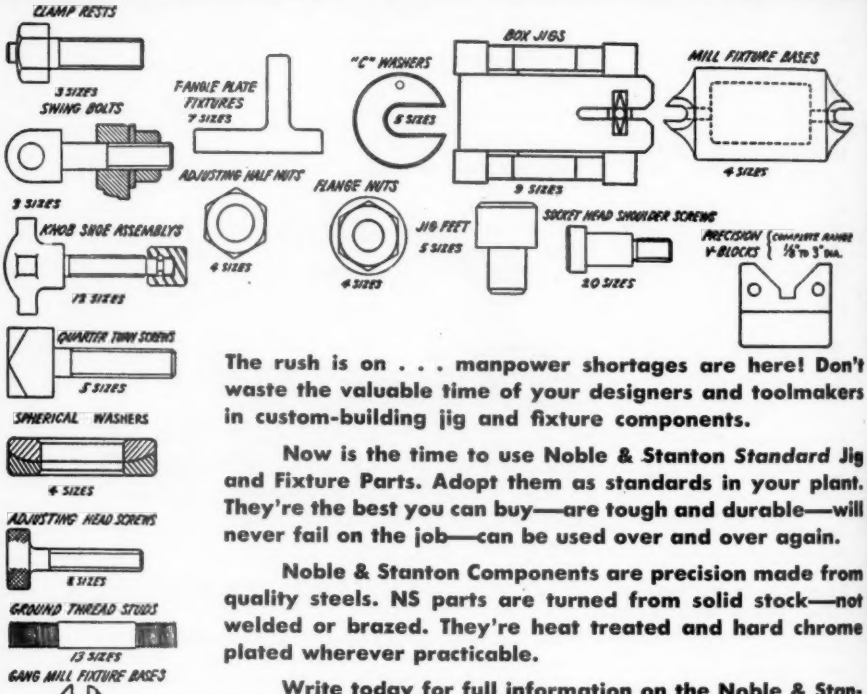
Zagar TOOLS FOR INDUSTRY and SPECIAL MACHINERY

SEE ADVERTISERS INDEX, PAGE 103, FOR KEY NUMBERS

SAVE MAN-HOURS

OF YOUR DESIGNERS AND TOOLMAKERS!

USE NOBLE & STANTON STANDARD JIG AND FIXTURE PARTS



The rush is on . . . manpower shortages are here! Don't waste the valuable time of your designers and toolmakers in custom-building jig and fixture components.

Now is the time to use Noble & Stanton *Standard* Jig and Fixture Parts. Adopt them as standards in your plant. They're the best you can buy—are tough and durable—will never fail on the job—can be used over and over again.

Noble & Stanton Components are precision made from quality steels. NS parts are turned from solid stock—not welded or brazed. They're heat treated and hard chrome plated wherever practicable.

Write today for full information on the Noble & Stanton line of over 300 parts. They cost less than one-third the cost of toolroom manufacture. Tracing sheets are available for every part—saving you design time. Try a few of the items—or stock the whole line!

WRITE FOR CATALOG. Send today for this free 52-page book of drawings, specifications and prices.

NOBLE & STANTON, INC.

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INFORM-A-GRAM KEY NUMBERS

PUBLICATION PREVIEWS

DIE-CO Spring Catalog No. 403 is offered by The Die Supply Co. The "M" and "H" spring series are made of Electric Furnace Chrome Vanadium Wire with a special surface treatment to increase the safe stress load.
Inform-A-Gram No. B57.

"Quality" Dies, completely and exhaustively inspected at every step in the die making process to make sure that the dies are right, are the subject of current Quality Hardware & Machine literature.
Inform-A-Gram No. B58.

The Buck "Ajust-Tru" Chuck features .0005" precision with scroll chuck rechucking speed. It handles collet and step collet work and is adaptable to dividing heads, grinders, screw machines and lathes. Detailed, illustrated literature is procurable.
Inform-A-Gram No. B59.

Leslie Model A Hand Punch Press is presented in an illustrated circular. This publication also shows punches and dies available from stock from Leslie Welding Co.
Inform-A-Gram No. B60

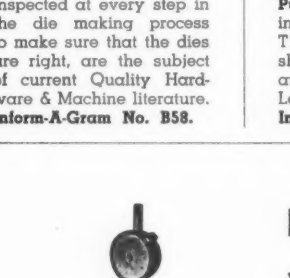
A New B & S Automatic Cutting-Off Machine, Opposed Spindle Type, is described in current literature. This machine has an opposed spindle which is driven in the same direction and at the same speed as the work spindle. This supports and drives the work at both ends, permitting cutting off the piece without leaving any teat and eliminating second operations. BROWN & SHARPE MFG. CO., 235 Promenade St., Providence 1, R. I.
Inform-A-Gram No. B61.

The Empco Jack now features vibration absorbing mounting pads. These pads are of a new vibration absorbing material developed for use under heavy loads to eliminate creepage and reduce machine maintenance costs due to vibration. Enterprise Machine Parts Corp. will supply detailed literature on this leveling jack.
Inform-A-Gram No. B62.

Whitney-Jensen No. 5 Jr. Hand Punch is a lightweight, yet durable tool with an adjustable locating stop clearly graduated to permit quick setting to any throat depth up to 2". Whitney Metal Tool Company's 48-page Catalog No. 16-50 contains full details.
Inform-A-Gram No. B63.

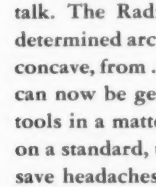
Marvin's Dividing Head is a small unit of extreme accuracy and unusual range of divisions, adaptable to meet many defense requirements. Newly published literature from Marvin Machine Products, Inc., tells the whole story.
Inform-A-Gram No. B64.

Prosser Carbide Grinders are fast, thrifty and versatile machines. A new catalog describes floor and bench models, chip-breaker, drill-grinding and other attachments.
Inform-A-Gram No. B65.


PATENTED

IT'S EASY ON YOU, AND YOUR GRINDING ROOM

The small, precision-built machine you see above is the Radi-Form, a grinder attachment, that does almost everything but talk. The Radi-Form can move the work in a predetermined arc of any desired radius, from 1/16" to 2" concave, from .00 to 2" convex, which means that radii can now be generated even on carbide tipped cutting tools in a matter of minutes, to within .0005 accuracy on a standard, unformed, cupped diamond wheel. You save headaches, time, and gain increased production. Write for literature and prices that will surprise you.



W. F. MEYERS CO., INC., BEDFORD, INDIANA

PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION

The Logan Aridifier, which cleans and dries compressed air and removes 92% of oil, water and dirt from gas and air lines, is described in Bulletin 1150. Of particular interest is a list of typical average CFM requirements on the various pneumatic applications. LOGAN ENGINEERING CO., 4901 W. Lawrence Ave., Chicago 30, Ill.
Inform-A-Gram No. B66.

GEMCO Precision Shapers are available in three models—universal, production and plain—all LUBRIGARD protected. Bulletin D, issued by General Engineering & Mfg. Co., gives detailed descriptions.
Inform-A-Gram No. B67.

Punching and Forming Dies for all sizes and makes of press brakes are made by Dreis & Krump Mfg. Co. The company's current catalog provides complete details.
Inform-A-Gram No. B68.

The Baldor Carbide Tool Grinder is presented in descriptive literature. Price of this grinder includes everything needed to sharpen carbide tools quickly and accurately.
Inform-A-Gram No. B69.

The "Helix-Master" can be set up on your milling machine to cut cams up to 9" diameter easily and accurately. Sheffer Collet Co., the manufacturer, offers detailed literature.
Inform-A-Gram No. B70.

The Lassy Work Holder is accurate to .0002" in 3" for quick setups on lathes, grinders, jig borers, milling machines and drill presses. Literature is available.
Inform-A-Gram No. B71.

"Superior" All-Steel Die Sets and equipment are shown in current Bulletin No. 850. Exclusive lifting equipment makes for safer, easier handling.
Inform-A-Gram No. B72.

Milling Cutters and Tracers for Keller Machines are presented in brand-new 16-page Circular No. 531 of Pratt & Whitney. Complete price and size information is given. PRATT & WHITNEY, Div. Niles-Bement-Pond Co., 15 Charter Oak Blvd., W. Hartford 1, Conn.
Inform-A-Gram No. B73.

The AMC Demagnetizer is featured in an illustrated circular prepared by Alois Mfg. Co. One pass through this improved demagnetizer removes all magnetism from processed parts.
Inform-A-Gram No. B74.

The New 2½" Hitch Feed of H. E. Dickerman Co. is designed to handle lighter gauge stock (up to .050" thick). Detailed literature is obtainable.
Inform-A-Gram No. B75.

Long Drills and Diamonds are among the inexpensive items described in the new, 128-page Eastern Tool Supply catalog.
Inform-A-Gram No. B76.

Siewek Fixture Clamps and Fittings. Full-size template drawings of these parts are offered by the manufacturer.
Inform-A-Gram No. B77.

HERE'S WHY: Heavily ribbed, smoothly machined cast-iron top provides a "surface plate" . . . Table equipped with lock-leveling screws . . . Steel shelf in sturdy steel welded base . . . Steel tool box shelf, guard rail, and drawer with lock . . . Vise and individual light can be easily attached . . . Bench is portable. Write for details.

THE CHALLENGE MACHINERY CO.

Office, Factories, Show Room — Challenge — *Grand Haven, Michigan*

SEE ADVERTISERS INDEX, PAGE 103, FOR KEY NUMBERS

PUBLICATION PREVIEWS

Phoenix Brand Non-Scaling Compound is an easy-to-use, specially compounded powder that eliminates scale formation, pitting and decarburization of tools and dies. The Parker Stamp Works, Inc., is mailing descriptive literature.
Inform-A-Gram No. B78.

Hand Wheels, cast iron hand knobs, steel clamping handles and threaded plastic balls are included among the items described in the current Reid Tool Supply catalog.
Inform-A-Gram No. B79.

Abrasive Machine Tool's M34 Surface Grinder features a 6" segmental type grinding wheel that is direct driven by a 5 hp, 3450 rpm Pope Motorized Spindle. This machine, for the precision grinding of flat dies, washers, punches, spacers, etc., is the subject of current literature.
Inform-A-Gram No. B80.

Tamms' Blue Layout Dope speeds layout on all metals. Samples and descriptive literature are offered by the manufacturer.
Inform-A-Gram No. B81.

AIR-MITE AIR CYLINDERS

SINGLE ACTING

MIRO

DOUBLE ACTING

CLEVIS

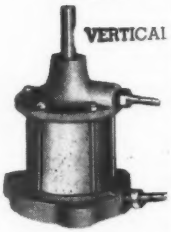
Worth Their Weight in GOLDen Man-Hours

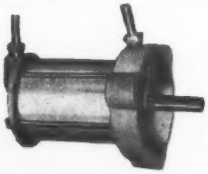
SAVE time, spoilage, cost . . . speed production . . . reduce fatigue . . . on all drilling, reaming, tapping and processing jobs. Available in 1", 1½", 2¼", 3", 4" and 5" diameters; stroke length optional. Single or double action; all mountings.

Write for complete catalog of Air Cylinders and Air Arbor Presses.

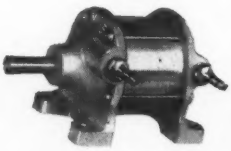
AIR-MITE 2653-A West Lake Chicago 12, Illinois

VERTICAL





VERTICAL FACE



PARALLEL

ABC Bushings, made of steel having a chromium and/or tungsten content, are described in a catalog and price list offered by Accurate Bushing Co. The following types of drill jig bushings are included in this literature: headless press fit; slip renewable; fixed renewable; and head press fit.
Inform-A-Gram No. B82.

Kempsmith LH Miller, a rugged, yet lightweight milling machine designed for the many "in between" jobs is the subject of Bulletin No. 127. This miller bridges the gap between low-range hand millers and big, expensive machines.
Inform-A-Gram No. B83.

Whistler Adjustable Perforating Dies are fully described in well-illustrated Catalog No. 48. Since these dies are quickly and easily rearranged, sudden change-orders can be met without tying up press production.
Inform-A-Gram No. B84.

The Heimann Transfer Screw Set is a self-contained, complete tool that provides a faster, more accurate way of transferring screw holes. The manufacturer is mailing a new price list on this product.
Inform-A-Gram No. B85.

Carbide and High Speed Burs, rotary files, countersinks and many other tools are among the items described in literature from Grobet File Co. of America. Over 5000 shapes, sizes and cuts are included.
Inform-A-Gram No. B86.

"Comtorplug" Internal Comparator. Illustrated Bulletin No. 40 gives complete construction features and instructions for use of this portable production and inspection gage.
Inform-A-Gram No. B87.

PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION

Two "Meadmatic" Timer Models are described in catalog sheets obtainable from Mead Specialties Co. These simple pneumatic timing devices eliminate "watchful waiting" by the operator of a working machine. He merely starts the cycle; the timer stops it. Thus a second machine, or battery of machines, can be loaded while the first is working. There is no waiting time. MEAD SPECIALTIES CO., Dept. T-32, 4114 N. Knox Ave., Chicago 41, Ill.
Inform-A-Gram No. B88.

Hauser Burnishing Method. An illustrated bulletin giving details and specifications of machinery developed by Henri Houser Ltd., Bienne, Switzerland, to implement the new Hauser Burnishing Method has been issued. Write for it to HAUSER MACHINE TOOL CO., 30 Park Ave., Manhasset, N. Y.
Inform-A-Gram No. B89.

The Atlas Milling Machine handles the full range of milling operations —slabbing and facing and end milling, keyways, finishing, and layout work. Atlas Press Company's General Catalog devotes several pages of pictures and text to this versatile miller.
Inform-A-Gram No. B90.

The Illinois Die Filing Machine is an accurate, smoothly-operated machine that files, saws and stones the most intricate die shapes. An illustrated brochure contains complete information.
Inform-A-Gram No. B91.

New Honing Tool. Descriptive literature on the Odee-HONE, a single tool for honing any cylindrical surface from ½" to 2½", is procurable from the manufacturer, Micromatic Hone Corp.
Inform-A-Gram No. B92.

The Crystal Lake Wet Surface Grinder is designed primarily for carbide work. The 15" height allows work to be ground that heretofore was ground on planer type machines. Illustrated literature has been prepared by Crystal Lake Grinders.
Inform-A-Gram No. B93.

Complete Fixture Clamp Assemblies or any component part are made by West Point Mfg. Co. Template drawings of all clamps and parts will be sent upon request.
Inform-A-Gram No. B94.

The Tool Steel Selector of A. Milne & Co. consists of a handy chart listing distinctive features, general data and heat treating data on several types of tool steel. Typical analysis, wear resistance and comparative machinability are among the data listed.
Inform-A-Gram No. B95.

The New Miti-Mite Magnetic Holder eliminates all clamps in the holding of test indicators. Enco Mfg. Company's interesting Bulletin No. 600 describes this time-saving holder.
Inform-A-Gram No. B96.

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Every tool shown represents a full line of quality tools, known the world over as the finest of its type.

Armstrong Tools are stocked by Industrial Distributors.

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SEE ADVERTISERS INDEX, PAGE 103, FOR KEY NUMBERS

SPECIFY KASSON PRECISION COLLETS AND ATTACHMENTS

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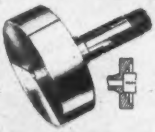
1A, 4C
5C



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HEAT TREATED
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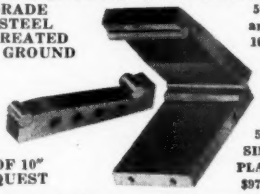

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Kenco's 4-in-1 Punch Press can be converted from standard to either long type, horn or half punch press in a matter of minutes. Detailed specifications and design features of this new press can be found in a brochure procurable from KENCO MFG. CO., Dept. B, 5211 Anaheim-Telegraph Rd., Los Angeles 22, Calif.
Inform-A-Gram No. B97.

Special Boring Bars for precision work can be equipped with standard Microbore Tools. Each tool is independently adjusted by proved micrometer, vernier principle. DeVlieg Microbore Co. will mail a detailed catalog upon request.
Inform-A-Gram No. B98.

Graymills Stocklube Systems provide an efficient, modern way of lubricating roll, strip and individual metal sheets. A new catalog gives construction and engineering details.
Inform-A-Gram No. B99.

Industrial Dust Control is fully treated in a 50-page, digest-size book published by Pangborn Corp. This informative booklet is liberally illustrated with 15 photographs and 10 line drawings. Write to PANGBORN CORP., Dept. TDJ, Hagerstown, Md.
Inform-A-Gram No. B100.

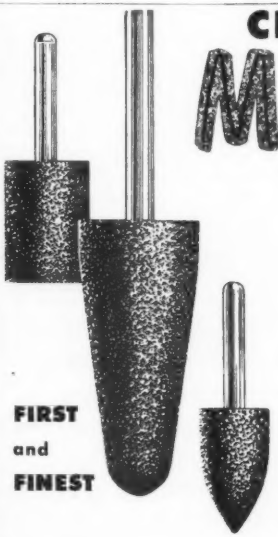
The New Di-Acro Rod Parter holds tolerances to .001" on duplicated cuts. The ends are square, and roundness is maintained. O'Neil-Irwin Mfg. Company's 40-page "Die-Less Duplicating" Catalog contains a complete write-up of this precision rod cutter.
Inform-A-Gram No. B101.

Wesson Angle Vise Bulletin. Any standard grinder can be adapted quickly to precision angle grinding with a Wesson Universal 3-Way Angle Vise. This illustrated publication tells how to lower costs with a Wesson Vise.
Inform-A-Gram No. B102.

Fauver "Bullseye" Coolant Spouts are covered in new Bulletin CS-1150. They will stay in place without any support and are adjustable to any position by the touch of the hand. J. N. FAUVER CO., INC., Dept. TD, 49 W. Hancock, Detroit 1, Mich.
Inform-A-Gram No. B103.

The Levin Precision Lathe Catalog illustrates and describes the company's full line of lathes and accessories. Designed for working with small parts, the Levin Lathe will hold a rod .004" in diameter with complete accuracy.
Inform-A-Gram No. B104.

Reeves Variable Speed Drives are presented in an attractive, 12-page bulletin, No. G-509. Basic operating principle is described and representative rating tables and dimensional drawings are included. REEVES PULLEY CO., Dept. TDJ, Columbus, Ind.
Inform-A-Gram No. B105.



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SEE ADVERTISERS INDEX, PAGE 103, FOR KEY NUMBERS

. . . from page 84

platen some distance below the horizontal center line of the sprue, Figure 32; for by so doing, the die caster is able to employ a die casting die whose cavities all lie geometrically above the center of the injection chamber, thus obviating the need for any runners which have to curve around the sprue to direct the incoming molten metal to cavities below it.

Figure 31 illustrates a portion of a spray showing the sprue with three runners leading off at the top, such as is occasionally employed in the case of a multiple cavity die.

Shown in Figure 33 is a portion of a spray in which the runners "a" to "g" are merely branches of two main arms that extend around the periphery of the sprue.

Figures 34A and 34B show a die in which the runner take-off system shown in Figure 33 has been employed.

The runner arrangement depicted in Figures 31 and 33 is, of course, resorted to when the die designer sees fit to position his sprue in the center or near center of the die and to distribute the individual die cavities about the sprue in symmetrical form. This arrangement also has many advantages from a thermal balance standpoint.

When the die designer chooses to locate his sprue at the bottom of the die and to position the individual die cavities above the center line of the sprue, the runners will, of course, open into the sprue above its horizonal center line.

The principal disadvantages of the first of these two methods of joining the runner or runner system to the sprue are that it tends (1) to concentrate a large mass of hot metal in a relatively small die area, and (2) to cause one or more of the individual die cavities to be filled before the others and at their expense. This latter condition results from an improperly proportioned set of runner leads and branches, and may be avoided through the use of correctly designed runners.

(To be continued)

★ ★ ★

Irreplaceable Skills

Efforts of the tool and die industry to preserve and extend its manpower for the heavy flood of rearmament tooling now beginning to flow into contract shops have been revealed by Herbert F. Jahn, president of the National Tool and Die Manufacturers Association.

Association officers have asked New England and New York Selective Service Boards to give favorable consideration to requests for the deferment of tool and die makers on the grounds that these men are "necessary to the maintenance of the national health, safety and interest, and vital to armament manufacturing," Mr. Jahn stated.

Recognizing the need for clear understanding of the skills that are irreplaceable without long training, association officials pointed out that before any ordnance item can be put into mass production, special tooling must be designed and manufactured. One tool and die maker's output makes it possible for many machine operators and countless assemblers to work on mass production.

The idea that men under 26 cannot be highly skilled is "entirely falacious," Selective Service officials were told. "With a four-year apprenticeship training starting at 16 to 18, the apprentice becomes a journeyman tool and die maker at 20 to 23," said Mr. Jahn.

KNOCK-OUT HIGH COSTS WITH ROUSSELLE PUNCH PRESSES

OBI HORN DEEP THROAT

HIGH SPEED PRODUCTION
LOW ANNUAL MAINTENANCE
for details write
SERVICE MACHINE COMPANY
7627 S. Ashland Avenue ● Chicago 20, Illinois

PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION

. . . Cost Cutting, from page 51

Using the new equipment, the work proceeds substantially as follows. The truck load of Formica sheets, which had previously been placed beside the feeding table which flanked the sander, is now rolled onto the platform of the Portelvator, which is installed at the spot previously occupied by the "feeding table". The floor space previously occupied by this four-wheeled truck is thus freed. When the truck has been rolled onto the Portelvator platform at floor level, the platform is lowered sufficiently to bring the top sheet of the stack of Formica to proper feeding level.

Operation No. 1 consists of feeding a single sheet of Formica into the Micro Grinder. (The Micro Grinder incorporates no inherent possibility of damage to the face of the sheet of Formica, so the placing of protective cardboards is eliminated.)

At the receiving end of the Micro Grinder another identical Portelvator has been installed, displacing the "receiving table" previously used, and saving the floor space previously occupied by the receiving truck. At the beginning of an operation an empty truck is rolled onto this Portelvator at floor height, the Portelvator is then raised to its extreme limit, 11" above floor level, and the sheets being received from the Micro Grinder are placed directly onto this receiving truck.

The operations of moving each individual sheet from truck to feeding table and from receiving table to truck have been eliminated, as have the operations of placing and removing the protective cardboard sheets. Furthermore, the Formica sheets now requires no lifting, but are slid from truck to grinder and from grinder to truck.

Conclusions drawn from a comparison of the new technique with the old, are as follows:

1. Four men now produce twice as much as sixteen men formerly did. This is an increase of 800% in manual effectiveness.

FOR DETAIL MARKING OF NAME PLATES CAN BE USED ON WOOD, PLASTICS, ETC.

Now there is a new labor-saving device — one that will really save many dollars. It's the AUTOMARK Electric Metal Marking Typewriter. Its uses are almost limitless where metal marking, once a slow tedious operation, can now be accomplished in one-fifth the time formerly required. The AUTOMARK has been perfected for the detail marking of name plates — no levers to pull — no dials to spin—it's all-electric, with automatic table feed. It actually will reduce the cost of production dollars five times by its speed. Strong enough to mark on steel up to ½" thick, yet can be adjusted to mark on wood or plastics. Simple to operate, it has a letter wheel made from high grade alloy tool steel. Type sizes interchangeable—1/32" to ¼" — any size wheel can be inserted quickly, easily.

For further information write Dept TDJ

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Mfd. by Defiance Machine & Tool Co., Inc., St. Louis, Mo.

SEE ADVERTISERS INDEX, PAGE 103, FOR KEY NUMBERS

STOP DUST

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with

DUSTKOP

- 22 models
- Low Cost
- Immediate Shipment

Aget-Detroit Co.

213 Main St. Ann Arbor, Mich.

Norton Company Adds Electric Furnace Plant

Norton Company, Worchester, Mass., has recently opened a new electric furnace plant for the manufacture of silicon carbide abrasive at Cap-de-la-Madeleine, Quebec. The plant, purchased in 1949 from Durham Chemicals, (Canada) Ltd., will provide expanded facilities for a 50% increase in the manufacture of Crystollon abrasive, Norton's trade name for silicon carbide, in addition to that now made at the company's electric furnace plant at Chippawa, Ontario.

ETALON UNIVERSAL VERNIER CALIPER

Manufactured by the famous Tool Makers, P. Roche, Ltd.

●Combination inside and outside measurement with knife edges, convenient depth gauge included ●All readings on same vernier ●Graduated to either 1/1000th and 1/128th inch or 1/1000 inch and 1/20th of a mm ●Made entirely of finest, hardened stainless steel ●Renowned SWISS craftmanship guarantees highest precision ●Price (fob N.Y.) $19.95.

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2. Sheets are hauled 66⅔% less than formerly.
3. Floor space utilized, per sheet processed, is ⅛ of that formerly used.
4. Production has been increased 200%.
5. Maintenance, distributed over the life of the Micro Grinders and Portelvators, will probably amount to about the same as formerly.

The Formica Company estimates that ⅝ths of this improvement is attributable to the Micro Grinders, and that ⅜ths is attributable to the Portelvators.

Manufacturing plants in practically every manufacturing category have had comparative experience with the new technique of material positioning at the machine. Some case histories show up to 400% improvement. Many instances are on record where after one installation additional units were paid for out of savings effected.

★ ★ ★

Nuclear Reactor School

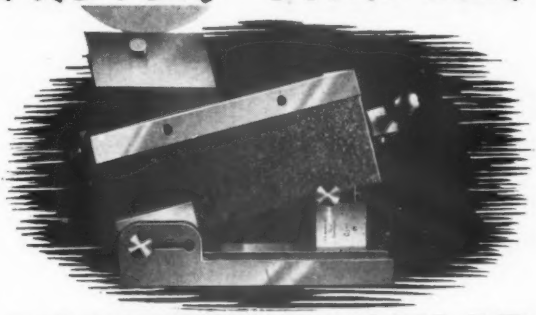
Industrial firms interested in obtaining special training in nuclear reactor technology for experienced engineers in their employ are invited to sponsor the enrollment of these men in the 1941-52 session of the Oak Ridge School of Reactor Technology. Application deadline is April 1, and the school term begins Sept. 10, 1951. Experienced engineers can obtain a thorough understanding of the specialized problems with which the Atomic Energy Commission deals in its nuclear engineering program. Full information and application forms may be had by writing to the Director, Oak Ridge School of Reactor Technology, P. O. Box P, Oak Ridge, Tenn.

Pressed Metal Institute

The Spring Technical Session of the Pressed Metal Institute will be held Thursday and Friday, March 29 and 30, at the Hotel Carter, Cleveland, Ohio. The first day's sessions will be on Tolerances and Die Standards. The second day's program will cover Safety Hints and Conversion to Stampings. The latter topic is especially important as the stamping industry becomes faced with the biggest military conversion job in history.

Conducted under the auspices of the Pressed Metal Institute, 13210 Shaker Square, Cleveland 20, Ohio, this Technical Session is open to all who are interested.

FASTER-SIMPLER



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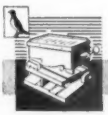
For any angular set-up, whether single or compound, simply insert standard gauge blocks between the Magna-Sine plates. Proper gauge blocks are indicated in the Robbins Table of Constants. Positive accuracy in a few moments. Work is securely held by magnetic attraction. In two models and sizes; also non-magnetic models for inspection set-ups.



OMER E. Robbins COMPANY

Manufacturers of the MAGNA-SINE and Other Precision Tools

5722 TWELFTH ST. • DETROIT 8, MICH.

. . . from page 53

Precise Gaging of Overrunning Cam Rings

Hardened steel rings that fit into the three smallest vaned wheels are important parts of the torque converter in the Chevrolet's new Powerglide transmission and are produced at the company's Cleveland plant. Because many dimensional limits on these parts are very close, gaging equipment has been carefully developed for rapid and precise checking.

Each ring has eight cam surfaces in notches cut in the inner diameter. These surfaces are not concentric with the piece and are checked in an optical projection instrument affording 10 to 1 magnification, the workpiece being turned by hand in a V-block to bring successive cams into projecting position. The projected image of the cam contour must come, of course, between limiting lines marked on the screen.

Cams are also checked for taper of the surface relative to the axis of the piece in an air gage designed and built specially for this operation, Figure 3. The ring is set successively in eight positions corresponding to the eight cams. There are three air jets in line opposite the cam and the corresponding readings determine whether or not the taper in the width of the cam exceeds the 0.0002" maximum allowed.

Deviation from a perfect circle on the outer diameter is checked in the setup, Figure 4, using an air gage in combination with a yoke having two opposing air outlets, with the piece positioned horizontally and rotated slowly by the operator's thumb. Only rings that are not out of round by more than 0.0005" pass this test, and the gage scale, graduated in 0.0001" divisions, permits quick determination of any out-of-round condition that may exist.

★ ★ ★

MARSHALL STEEL CO., McCook, Ill., has recently completed the installation of a new 84" hearth heat treating furnace of 8000 lbs. capacity to expand and facilitate a more complete service. This new furnace will be used for the spherodize annealing of the tool steel used for the company's "Aristocrat" line of ground flat stock, and general heat treating.

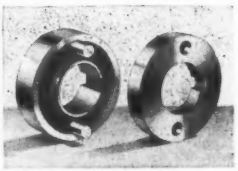
Consult Your Local Distributor for Full Information

Yes, sir! a complete line in all diameters to meet every slitting and slotting requirement:

(1) ***Master-Cut***—a standard blade, for milling machine purposes generally.

(2) ***Triple-Chip***—a deluxe blade, for low cost operation and highest production *with accuracy.*

Also, special blades to order. Contact your local dealer or write us in Cleveland for full information and Bulletin No. 250-J.



Dual Drive Adaptors optional on all M. & M. slitting and slotting blades. Dual Drive reduces stresses on driving means; makes possible blade interchangeability.

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PENTON BUILDING • CLEVELAND 13, OHIO
COMMAND OUR UNPARALLELED EXPERIENCE IN CIRCULAR SAWING

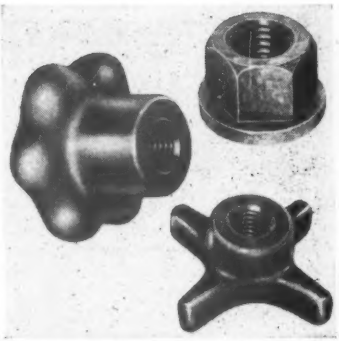
PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION

Cast Iron Hand Knobs and Flanged Nuts

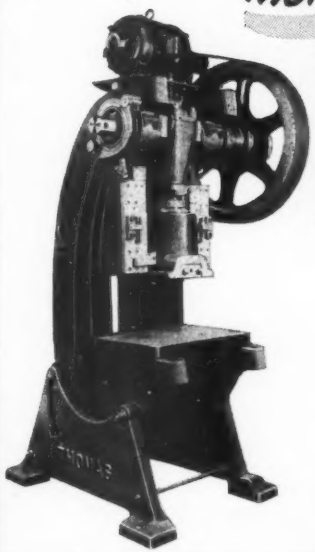
Recent additions to the products made by Northwestern Tool & Engineering Co. include a complete line of cast iron hand knobs with a black penetrate finish. They are now being furnished in both star and hexagon types and can be obtained plain, tapped or reamed in sizes from ¼" up to ¾" inside diameter.

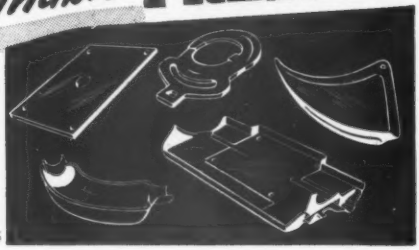
Flanged nuts with a hardened finish in all sizes from $\frac{5}{16}$" up to and including 1" inside diameter can also be furnished by the company. These nuts may be used to replace loose nuts and washers commonly used on jigs, fixtures, etc.

A detailed catalog is obtainable by writing to NORTHWESTERN TOOL & ENGINEERING CO., 116 Hollier Ave., Dayton 3, Ohio, or by **circling Inform-A-Gram No. D9.**



THOMAS *OPEN-BACK Inclinable* PRESSES





These recently introduced Thomas Inclinable Presses are now available for reasonable deliveries in 50, 75 and 100 ton sizes. They fittingly supplement the nationally famous line of Thomas equipment for Industry's varied metal-fabricating requirements. Write for information.

THOMAS
MACHINE MANUFACTURING COMPANY
PITTSBURGH, 25, PA.

. . . from page 90

ing is rejected.

Taper of the splines is determined by using special pin wires and a special dial bore gage. Readings are taken at the top and bottom ends of the splines. The difference between these two readings must not exceed .0002" per inch.

At this point the part is given a complete finishing grind and the inspection on all outside and inside diameters is performed with the part mounted on the spline arbor between centers as previously described. Concentricity must be held to .002" and parallelism to .001". An additional requirement is that the hub, H, Figure 22, must be held parallel with the pitch diameter of the spline within .0002".

The final grinding of the stud diameters is inspected with the shadow graph and gage blocks, using the same procedure as previously described. These stud diameters are held to .0004" tolerance. The basic bolt circle is checked with the same equipment and is held to a .002" tolerance. All length dimensions are inspected with the same fixtures as shown in Figure 20, but with gages having closer tolerances.

Final Inspection

The final inspection procedure repeats the methods previously utilized in determining the accuracy of the final dimensions. Every part receives a 100% inspection. Great care must be taken to be sure all operations have been done completely and correctly. Finishes must be such that there are no tool marks. All radii must be checked for proper size and all pieces completely burred so that there are no sharp edges.

After the final inspection, all parts are again given the Magnaflux test to see that no cracks have developed during the heat treating and grinding operations.

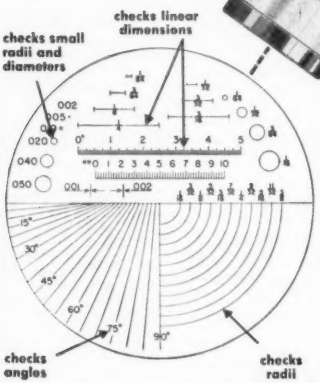
For the successful methods and procedures that have been evolved for this tooling and production program, we wish to acknowledge and credit the efforts of: Louis H. Fike, Superintendent; George Resetar, Chief Inspector; and Frank Hunsdorf, Foreman of Grinding Department.

new

POCKET COMPARATOR

(pat. applied for)

Saves time and money inspecting small dimensions



A precision optical measuring instrument for fast, accurate inspection of small dimensions. Save time and money measuring wear on cutting tools, checking forms and dimensions of punches, dies and gauges—as well as radii, angles, chamfers, threads and small holes on production parts.

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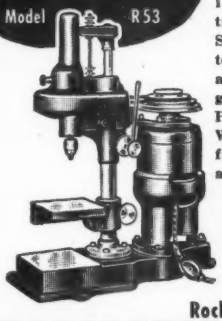

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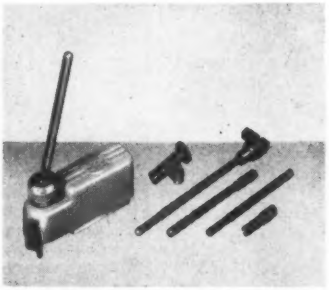

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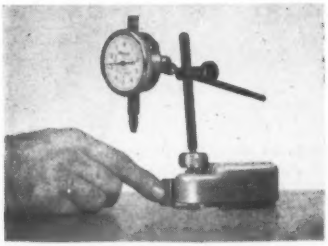

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"Production Know-How" Is Theme of ASTE Meeting

Mobilization of "production know-how" will be the theme of the entire 19th Annual Meeting of the American Society of Tool Engineers to be held in New York City, March 14-17. Due to the crucial need for defense production, this will be one of the most important meetings in the Society's history, according to ASTE officials.

A pre-meeting conference between industry and top military officials will be held Wednesday evening, March 14, as the kick-off event on the program. This conference will be in the form of an open forum to help develop the best ways for industry and the armed forces to work together in correlating available production techniques with military requirements. Roger F. Waindle, general manager, Industrial Products Division, Elgin National Watch Company, and a vice president and national director of the ASTE, will preside.

A total of 34 papers will be presented at the technical sessions, which have been scheduled so that no two on the same general aspect of production will occur at the same time. A great deal of material will be read on pressworking, machining, tooling, quality control, machine design, plant layout, lubricants and other subjects.

Another important item on the meeting agenda is the schedule of tours through nine nearby manufacturing plants, selected for their interest and efficiency. Visitors will take home from these plants modern ideas that may be of great value to defense production when applied to their own home factories. All tours will start from Hotel New Yorker, meeting headquarters.

During the four-day meeting, national directors of the Society will meet to elect a new panel of officers; these will be announced at the banquet session, Friday evening. Other Society activities include a dinner for past ASTE presidents.

Host to the visiting tool engineers will be the Greater New York Chapter, assisted by the Northern New Jersey Chapter, the Mid-Hudson (Poughkeepsie) and the Philadelphia Chapters. General Chairman will be Harmon S. Hunt, Chief Tool Engineer, Bulova Watch Company.

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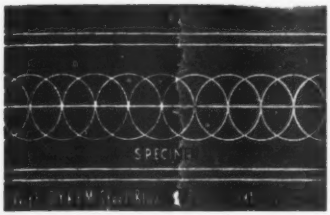

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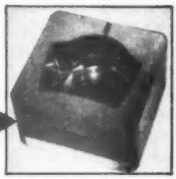

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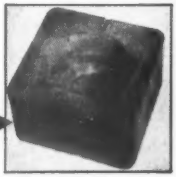

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. . . Stainless Steel

the solid chaser is used on sizes ⅞" and under. In the former class, there are four types of self-opening die head chasers, namely, the tangent, circular, inserted or milled, and the hobbed or tapped chaser, all of which have been used successfully on the stainless steels. The proper chaser grinds have been tabulated here for the self-opening type; the grinds for the solid type of chaser being similar to those for the hobbed type chaser.

The angles given are approximate and should be used as a guide. Chasers should have a 1½ to 3 thread lead for economical and satisfactory operation [2]. Hook grinds on hobbed or tapped chasers can be used to advantage when threading the austenitic stainless; this hook should be ground to include the first full tooth of each chaser. Slow spindle speeds are recommended; the speeds chosen to be in line with the specific grade of stainless steel being machined and the type of thread being cut. It is also customary to utilize both a rough and finish threading operation, removing approximately 0.005" to 0.010" in the finishing operation and using lapped finish ground chasers. Both sharpness of cutting edges and correct grinds along with the use of an efficient cutting fluid cannot be over-emphasized since these factors often prove the difference between a good and poor thread. Examples where threading is performed are shown in Figures 9 and 10.

Milling. This operation is exactly the opposite of turning in that the metal is fed into a revolving cutting tool; with speeds for milling being very nearly equal to those used in turning. As a general rule, smoothest finishes are obtained with helical or spiral tooth cutters running at high speed. They cut with a shearing action and as a result they cut more freely and with less chatter than the straight tooth types. Coarse tooth cutters are preferred since they are under less strain and permit higher speeds. They reduce cutting pressure, and due to the additional space between the teeth better chip clearance is realized.

A roughing cut should be run with heavier feeds and slower speeds due to

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the generation of more heat than from light finishing cuts. In both instances, both the work and tool should be flooded with a proper type of lubricant to carry off the generated heat; otherwise the work may distort and the tool edges will dull or chip rapidly. Once a milling cut has been started, it should continue to completion because if the miller is stopped, starting up again will result in undercutting. If a cut must be arrested, it is best to back the tool two or three turns behind the work before re-starting since this will eliminate the danger of "back lash" and minimize undercutting.

The action of milling cutters is intermittent; each tooth is starting with a zero chip thickness and ends with a maximum cut. Sufficient clearance behind the cutting edge of each tooth is, therefore, neessary to avoid a rubbing or burnishing action. "Hogging - in" and excessive vibration generally indicates too much rake or not enough clearance, or that possibly too high a cutting speed is utilized. Use short, stubby arbors with large diameters wherever possible. Rigidity improves the operation.

The recommended rake angle [5] is between 5° and 10°. A narrow land of 0.015" to 0.030" is employed; and both a primary clearance of 5° to 12° and a side clearance of between 3° and 9° are recommended [5]. On cutters up to 4" diameter, use the maximum clearance since small cuutters take a greater clearance angle than large cutters.

When cylindrical shaped cutters are employed with teeth on the outer surface only, helical cutting teeth on mills wider than ¾" should be employed. Helical cutters cut with a shearing action and both a finer finish and less chatter will be experienced. Cutters under ¾" in width can have straight teeth. Milling deep slots in stainless steel may present problems in chatter, binding and jamming of wide chips. The use of a staggered tooth cutter will be found beneficial for this type of operation; its alternating teeth cutting only one-half of the slot, thereby taking a smaller bite and producing a shorter chip. For end milling, the solid shank end mill is the preferred.

(Continued on page 136)

SEE ADVERTISERS INDEX, PAGE 103, FOR KEY NUMBERS

. . . Hot Pressing

Design Limitations

Hot-pressed carbide components are subject to the same shape limitations as powder metallurgy parts in general. Thus, lateral protrusions or projections, abrupt and assymetrical changes in cross-section, undercuts, re-entrant angles and internal or external threads must be avoided. All holes, splines, internal or external gear shapes must be parallel to the direction of pressing.

Regarding size limitations, cemented carbide pieces up to 9 inch diameters are economically produced at Sintercast by hot-pressing. Dies or parts smaller than ¾" in diameter are seldom practical by this method. The height of hot-pressed tungsten carbide components in the direction of pressing seldom exceeds 4 inches.

The ultimate development of the hot-pressing technique resulted from investigations in the direction of increased temperatures. It was felt that compacts could be more readily compressed to full densification if sufficient heat was conveyed to the powder mass to partially change the state of the binding metal. In order to conduct these tests, appropriate methods of heating the compacts were developed.

Heating Methods

The four heating methods now in use are: (1) convection heating, (2) resistance heating, (3) radiation heating, and (4) induction heating.

Convection heating involves heating the powder or preform as well as the die. In this "hot die" method, heat is supplied to the die by an electrical resistance furnace mounted inside the working space of a hydraulic or mechanical press. For low temperature work, the die may be simply heated with blow torches or gas burners.

Resistance heating generates heat either by passing a high amperage through the powder preform, or by passing the current through the graphite or metal mold. A disadvantage of resistance heating is its restriction of the

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compact's shape. Only small cylindrical bodies can be heated uniformly between the electrodes. Although bar-shaped compacts could be compacted lengthwise, it would be necessary to have a special die construction and a nonconducting material for the mold. Hot-pressing of irregular contours by this method is difficult if not impossible.

Radiation heating, a recent development, imparts heat to the compact through the radiations of a resistance-heated graphite screen that closely surrounds the mold and its contents. This method is claimed to result in a uniform temperature distribution throughout the mold and its contents.

Induction heating also heats the die and its contents externally. It does this through the use of watercooled induction coils mounted in the press and around the die. The chief advantage of this method lies in its ability to more quickly heat and cool the die, thus eliminating the necessity for ejecting the hot-pressed compact. This is especially advantageous in experimental work where the danger of oxidation during cooling must be eliminated.

Experimentation at Sintercast has proved the induction heating method to be highly expeditious in the production of special hot-pressed parts. One of the high-frequency induction hot-press units used in the Sinterforge process of producing tungsten carbides is shown in Figure 5. Its 12-kva input produces temperatures up to 1750°C or 3182°F. Its hydraulic system develops a plunger compacting load of 4000 lbs.

Pressure Ranges

It was found that the pressures necessary for hot-pressing vary over a wide range and depend upon the materials used. The lowest conceivable pressure for hot-pressing is the pressure required for complete densification of a material heated to a temperature infinitely close to its melting point. Since liquid metals are completely dense under normal conditions, the low point in the pressure

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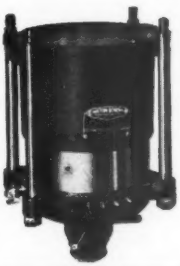

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range can be considered to approach atmospheric pressure.

The upper pressures needed for hot-pressing operations are obviously substantially below those necessary for cold-pressing. In fact, recurrent investigations of the hot-pressing technique revealed that the application of high temperatures resulted in the same density of compact using only 10% of the pressures necessary for cold-pressing. This was discovered through experimentation with a wide variety of powdered metals —irons, brasses, and many cemented carbides.

The Time Element

Consideration of the time element from the economic standpoint made the short application of pressure and heat desirable. However, there was evidence that densification and other physical properties of compacts could be greatly improved by prolonged application of pressure and heat. Increasing the temperature and time under sustained pressure tended to increase the number and area of interparticle contacts as well as the amount of plastic deformation.

Thus, experimentation into the powder metallurgy pressure-temperature-time relationship resulted in the development of a hot-pressing technique capable of producing cemented carbides of far superior physical and metallurgical properties as compared with those obtainable from conventional sintering methods.

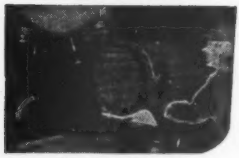
★ ★ ★

Moore Expands Facilities 25%

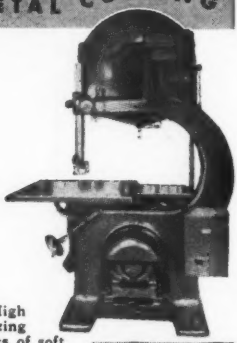
A $250,000 plant expansion program of the Moore Special Tool Company, Inc., Bridgeport, Conn., will shortly increase by 25% its facilities for manufacturing precision machine tools, according to Richard P. Moore, president. The new construction, an extension of the main plant on Union Ave., will add 15,000 square feet of floor space and $100,000 worth of new machine tools. It is expected to be in full operation very shortly.

The company is a leading manufacturer of jig borers, jig grinders, wheel dressers, die assembly machines and other toolroom equipment. It also operates a contract tool and die shop.

Cutting Hard-Tempered 1/8" Chrome Moley Steel



Sawing 16" Steel Piling



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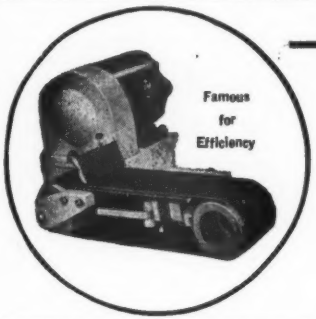

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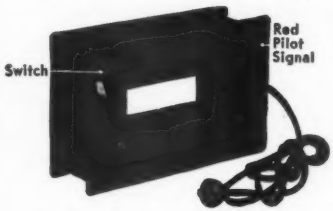

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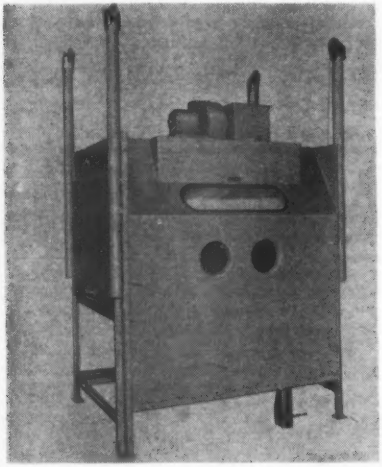
Fluid Abrasive Blast Surface Finish

The carbide tools that have shown the best cutting efficiency when under test are those which have the greatest tendency to gall when operated under the highest possible speeds and feeds. The tendency for carbide tools to gall under such service is minimized after being subjected to the Fluid-Abrasive Blast.



This treatment imparts minute and uniform pits or wells in the surface of the metal, thereby cutting down the area of the frictional surface and thus greatly reducing friction and resultant heat.

These pits retain the lubricant under pressure and will inhibit galling or checking of the tool due to heat. Pile up or welding of minute particles of metal on the cutting edge is also eliminated.

Users of the Fluid-Abrasive Blast finish have experienced an increase in carbide tool life between grinds of from 50 to 75%. The same increase is true also of steel tools. A test made on special step-cut counterbores showed an average of 150 cuts after regular grinding while 350 cuts were obtained after the blast finish.

A number of variables are involved in applying this finish to cutting tools. The selection of mesh of the grit to be used and also the air pressure maintained depend on the grain structure of the metal to be treated. The angle and direction at which the blast hits the tool must be determined by experiment and experience as well as the length of time the blast strikes the tool. Carbide tools should have more radius on the cutting edge than tool steel tools. Carbide and tool steel tools ground to too keen an edge have a tendency to start checking and chipping immediately upon being put to work. As a result, microscopic scratches are cut into the workpiece. When heat treating follows machining, these scratches become checks or fissures in the processed part.

Stamping, forming, forging and drawing dies treated by the Fluid Blast show up to 500% incerase in life before galling on stainless steel and aluminum parts.

★ ★ ★

New 60-Page Tool Catalog Announced

A comprehensively written and beautifully illustrated tool catalog, GT-250, has been issued by Carboloy Company, Inc. Its 60 pages include full-color photographs of the company's manufacturing and research facilities. Five pages are used to picture and describe some of the uses of cemented carbide, and there are seven pages of helpful technical data, "digested" from their Tool Manual.

The remainder of the catalog is devoted to a listing of standard tools and blanks now available. Specifications, photographs, typical applications, and diagrams accompany the listing of each tool or blank style.

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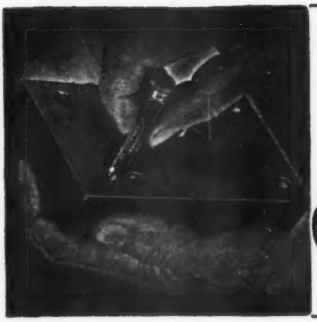

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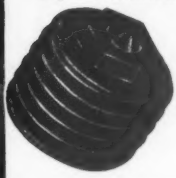

The Heimann Transfer Screw Set is a self-contained, complete tool. No wrenches or pliers are necessary. Made in $\frac{3}{16}$" to 1" diameters.

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All standard COLONIAL drill jig bushings are now made from Colonial #3—a new oil-hardening steel having many times the wear-resistance of former bushing steels. Also gives greater uniformity.

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SAVE YOUR DIES

DURANT Stock Oiler

- Prolongs Life of Die
- Eliminates Hand Oiling
- Saves Production Time
- Minimizes COSTS
- Variety of Sizes

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RUNS COOL AT 38,000 RPM

Roto-Master Hi-Speed grinder makes carbide roughing and finishing available to every shop. Designed for operations requiring precise "finger-tip" control, in conjunction with carbide burrs and mounted wheels from 1/16" to ¼" dia.

MAKES CARBIDE ROUGHING AND FINISHING AVAILABLE TO EVERY SHOP

Roto-Master's SUPER COOLING system enables operating speed of 38,000 RPM. Operation requires practically no pressure . . . consequently grinder can be used continuously for hours without heating.

Operates on 110-120 Volt AC or DC, Any Cycle.

Try Roto-Master in your shop. If not completely satisfied return within 15 days at no charge. If not rated send check or M. O. for $29.50.

$29.50

MASTER APPLIANCE MFG. CO., 4th at Ontario, Racine, Wisconsin

SEE ADVERTISERS INDEX, PAGE 103, FOR KEY NUMBERS

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For YOU and YOUR JOB

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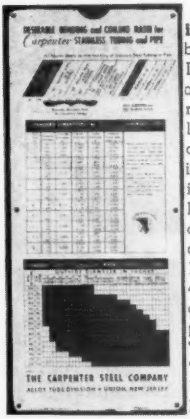
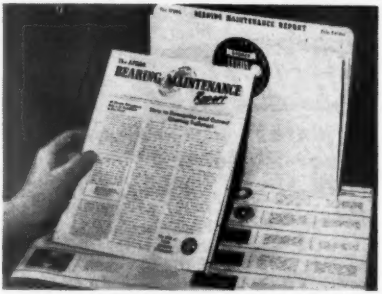
"The Power Tool Journal" is a six-times-a-year Delta technical publication filled with authoritative information based on performance studies made of production, maintenance and experimental operations in both the metal-working and woodworking fields. It illustrates interesting applications of various Delta machines. To get on the mailing list for this publication, write DELTA POWER TOOL DIV., Rockwell Mfg. Co., 600 E. Vienna Ave., Milwaukee 1, Wis.
Circle Inform-A-Gram No. C1.

The Production of a Quality Die Casting from idea to finished product is shown in a new sound motion picture offered by Doehler-Jarvis Corp. for showing before technical societies, users and prospective users of die castings, students, etc. The film, called "The Shortest Way," is 27 minutes in length and was filmed in the company's seven plants. DOEHLER-JARVIS CORP., 386 Fourth Ave., New York 16, N. Y.
Circle Inform-A-Gram No. C2.



A Stainless Tube Bending Slide Chart is offered by The Carpenter Steel Co. It presents data on desirable minimum radii for economical bending of stainless tubing and pipe. The chart covers tubing ranging from ⅜" to 5" OD size, in B. W. Gauges 22-11. Radii are given for machine bends (with or without mandrels) of 90° and 180°. Radii for bends of 45° to 180° in ornamental grade stainless are also provided. THE CARPENTER STEEL CO., Alloy Tube Div., Dept. TDJ, Union, N. J.
Inform-A-Gram No. C3.

"A Bearing Maintenance Report," intended to be a continuing study of bearing maintenance techniques and successful maintenance,



installation and removal procedures, has been published in pamphlet form by The Anti-Friction Bearing Distributors Association. A file folder type of binder, in which succeeding issues can be compiled, is being sent to each bearing user who requests it. This information is being offered at this time when such a strain is being placed on existing equipment and replacements tend to become more difficult. THE ANTI-FRICTION BEARING DISTRIBUTORS ASSOCIATION, 1900 Euclid Ave., Cleveland 15, Ohio.
Circle Inform-A-Gram No. C4.

Machine Knives are featured in the current edition of "Grits and Grinds," Norton Company's technical house organ. In a detailed article, E. T. Larson, Norton sales engineer, explains how careful grinding and honing of machine knives will produce a cutting edge that will stand up longer between grinds with the same or improved quality of cut. To get your name placed on the mailing list, write to NORTON CO., 1 New Bond St., Worcester 6, Mass.
Circle Inform-A-Gram No. C5.

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● **This new Yost vise has been designed expressly for use on drill press operations. Does away with special and costly jig fixtures.**

OFFERED IN TWO SIZES

Vise No.	Width of Jaw, Inches	Opens Inches	Weight Pounds
1D	3½	4	12½
2D	5	5½	23

Do you need a vise of ANY type?

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WHICH ARE YOU USING?

. . . the grunt-pull, hammer-wrecking bar, costly method of die separation . . . using two or three men? Results are pinched fingers, scored pins, battered dies and waste of time and money.

OR

. . . the modern efficient method that is now in actual use by hundreds of leading plants and die shops* —The Acro Die Set Puller method.
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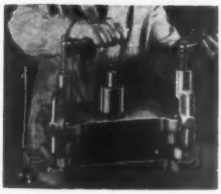

*List of users on request.

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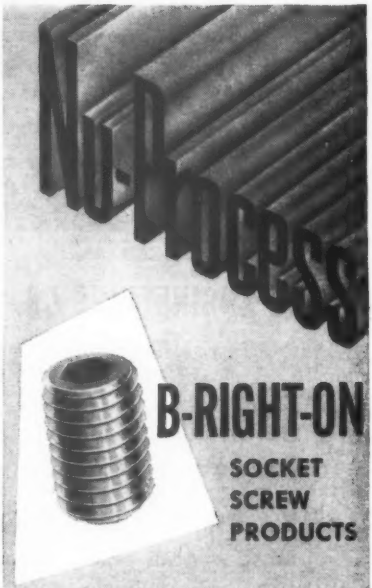

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Alloy steel is cold worked to form a continuous compact structure. In addition much closer tolerances are maintained.

Better service to dealer and user results from the high productivity of Brighton's processes.

Ask for Brighton Socket Screws from your industrial distributor. Write for new catalog.

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Screw & Mfg. Co.
1839 Reading Road
Cincinnati 2, Ohio

SEE ADVERTISERS INDEX, PAGE 103, FOR KEY NUMBERS

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TIME and MONEY
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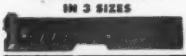
STOP-PINS
AVAILABLE IN 5 SIZES

FINGER STOPS
IN 3 SIZES



STOP-PINS are complete self contained units that hold securely in stripper plate. All sizes have 1/32" wall permitting insertion close to die or punch. No threads inside STOPS for springs to catch on. Write for literature and prices. SUPEREAM FINGER STOPS made in uniform width to fit any standard width slot. Just grind ends to fit. Write for literature.

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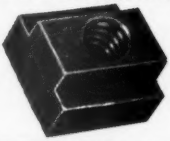

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THESE HANDNIBS LEAD IN POPULARITY

These indispensable handymen of the shop shear and nibble (outside and inside) up to 1/16" flat stock; openings for cutting 3/16", 1/4", 5/16", 3/8" rods. No. 5 also punches up to 1/2" holes in 1/8" stock. No. 4 available for bench or vise mounting; No. 5 standard or swivel bench mounted. Write for full details or ask your dealer for a demonstration.

NATIONAL MACHINE TOOL CO.
Dept. 131-C Racine, Wisconsin

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Combined Standard Steel Lists of AISI and SAE have been revised in a four-page technical card, 119C, available from The Babcock & Wilcox Tube Co. The card covers basic open-hearth and acid-bessemer carbon steels and resulphurized carbon steels, open-hearth and electric-furnace alloy steels, and stainless and heat-resisting steels. THE BABCOCK & WILCOX TUBE CO., Beaver Falls, Pa.
Circle Inform-A-Gram No. C6.

"Metallic and Non-Metallic Coatings for Gray Iron" is a new 76-page manual released by Gray Iron Founders' Society. It describes for the first time practical methods of applying all known types of coatings to gray iron. Single-copy price to non-members is $1.75. Write direct to GRAY IRON FOUNDERS' SOCIETY, INC., 210 National City-E. 6th Bldg., Cleveland 14, Ohio.

"An Introduction to Electrolytic Cleaning" has been revised and enlarged by The DuBois Co. Besides covering fundamentals, the new edition of this booklet discusses the cleaning of die-cast metals, the cleaning of cuprous metals, and soaker tank cleaning. Typical cleaning cycles and several case histories are given. Write for this booklet to THE DUBOIS CO., Dept. TDJ, Cincinnati 3, Ohio.
Circle Inform-A-Gram No. C9.

The Timken Graphitic Tool Steel Data Book, now in its ninth edition, contains 48 pages of valuable photos and data on heat treatment, applications, physical properties and machinability. This attractive booklet may be obtained by writing THE TIMKEN ROLLER BEARING CO., Steel and Tube Div., Canton 6, Ohio.
Circle Inform-A-Gram No. C10.

The New Eutectic Welding Alloys Chart is in the form of a six-page folder and contains specifications on nearly 100 different welding alloys used in welding, brazing and hard surfacing of steel, cast iron, bronze, etc. Included also is a full-page listing of "1001 Ways to Save in Your Plant," covering a wide variety of welding applications and the alloys recommended for maximum efficiency. EUTECTIC WELDING ALLOYS CORP., 40 Worth St., New York 13, N. Y., will provide copies of this chart.
Inform-A-Gram No. C7.

Bronze Casting Alloys are the subject of a 46-page reference book from American Manganese Bronze Co. This book briefly describes the chief bronze alloys used to make castings. General information on composition characteristics and applications is given. This book reduces to a minimum the long list of brass and bronze alloys on the market. AMERICAN MANGANESE BRONZE CO., Dept. TDJ, Holmesburg, Philadelphia 36, Pa., will honor all requests.
Inform-A-Gram No. C8.

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The recognized advantages of the three fluted end mills have made this tool one of the leaders in the complete line of Arrow "Fascut" End Mills.

All Arrow End Mills are precision made tools for precision and production work. Over 34 years of experience in the manufacture of types of rotary cutting tools assures users of Arrow products both quality and economy.

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SEE ADVERTISERS INDEX, PAGE 103, FOR KEY NUMBERS

Positive Action "Chuckmaster" Device

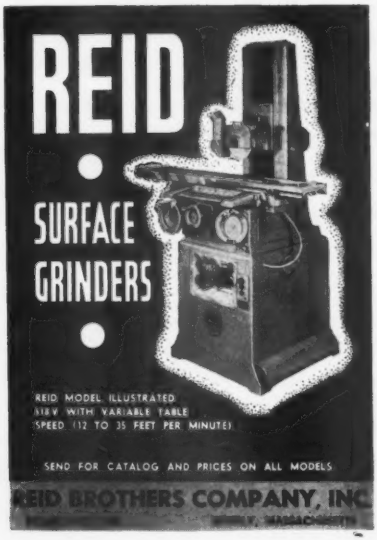
Positive chucking action with one-hand control is now obtainable with the "Chuckmaster," a universal chucking device.

Features that make this device outstanding are instantaneous change of workpiece without loss of accuracy, easily adjustable equalized holding pressure from 0 to 4½ tons, and capacity from .030" to 24" dia. of workpiece.

When hollow spindles are available, or turrets, the "Chuckmaster" can easily be attached in a manner similar to standard drawbar collet attachments. However, it is not limited to use with hollow spindles. The "Chuckmaster" can be set up and clamped in vises or dividing heads and used in a wide variety of machine setups. The illustration shows a "Chuckmaster" used with a drill press.

On lathes, grinders, drill presses and other machines, pieces can be held for roughing as well as for finest precision finishing. On a production run, uniform

accuracy of pieces is assured, as each piece is gripped with exactly the same amount of force. There are no wrenches to tighten nor hand wheels to turn—just one lever for positive setting to a uniform grip.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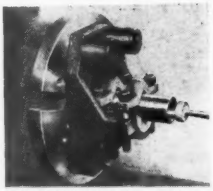
SURFACE GRINDERS
REID MODEL ILLUSTRATED
SIZE WITH VARIABLE TABLE
SPEED (12 TO 35 FEET PER MINUTE)
SEND FOR CATALOG AND PRICES ON ALL MODELS
REID BROTHERS COMPANY, INC.

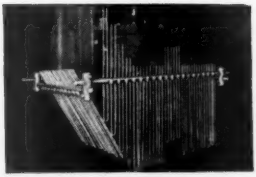
Lassy WORK HOLDER



Quick, accurate setups on Lathes, Grinders, Jig Borers, Milling Machines and Drill Presses.
Accurate to .0002 in 3"
Hardened steel "V" insert.
Also made with quick acting clamps for production work.

LASSY TOOL CO., Plainville, Conn.

ADJUSTABLE ROD GUARD
for Power Presses



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GRAY MILLS

AGITOR

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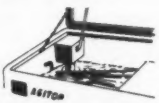
FOR PLANT MAINTENANCE DEPARTMENT, and repair and service departments, clean electric motors, tools, appliances.

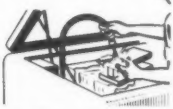
IN THE TOOL ROOM, for cleaning dies, tools, fixtures, machined parts, etc.

IN PRODUCTION for flushing chips and oil from machined parts, castings and assemblies.



1. Solvent discharged jet-like agitates tank for soak cleaning.

2. Fountain like discharge for large parts.



3. Stream of solvent thru hose used for flushing off parts and assemblies.

Safety features reduce fire danger. Semi-automatic cleaning action saves skilled hands for skilled work. Pays for itself in efficiency, faster and better parts cleaning.

3 sizes. Prices start at only $119.50.

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BRAND NEW PERFECT FIRST QUALITY MOUNTED ON ¼" STEEL MANDRELS

LIST VALUE $93.60

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Make no mistake. Do not let the un-heard of low price mislead you. This is NOT "surplus" goods, inferior merchandise or seconds. Every one of the 144 Wheels and Points is brand new, first quality and perfect. The type of mounting, quality of steel mandrels, grade of abrasive materials are identical to the finest on the market. Only because of our buying power, low overhead and small margin is such a sensational bargain possible!

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Plants all over the U.S. have been using Schupack wheels and points for years with excellent results. Our assortment includes 16 most popular sizes and types—9 of each or a total of 144. However, we can supply ANY ASSORTMENT you want. List the types and sizes and we will fill your order at no extra cost.

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W-200	9 @ .55e	4.95	B-104	9 @ .70e	6.30
W-185	9 @ .55e	4.95	B-61	9 @ .75e	6.75
W-203	9 @ .60e	5.40	B-135	9 @ .55e	4.95
W-175	9 @ .55e	4.95	B-111	9 @ .75e	6.75
B-121	9 @ .70e	6.30	B-101	9 @ .80e	7.20

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If after 10 days you are not fully convinced that this is the greatest wheel and point value in the industry, return the set at no cost or obligation on your part.

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Our Price $28.50 — You Save $65.10

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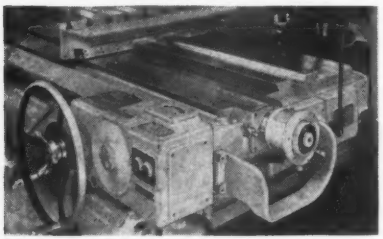
Jig Borer "Electrolimit" Measuring System

The largest (No. 4E) Jig Borer developed by Pratt & Whitney employs an entirely new measuring system for accurately locating large work under the machine spindle. Using cer-



tain basic features of the well-known Pratt & Whitney Electrolimit gaging principle, this new method of measuring has been designated the "Electrolimit Measuring System."

Basic one-inch spacing is obtained from the master measuring bar by electrical means, without making physical contact with the bar. The master bar has rectangular projections which are calibrated so that the distance between the magnetic centers of adjacent projections is precisely one inch, within a tolerance of twenty millionths of an inch accumulated error in the full length of the bar. Two of these master bars are built into the machine at right angles with one another, permanently sealed and protected; one 60" long on the underside of the table, for positioning the table longitudinally, and one 36" long on the underside of the carriage, for positioning transversely. Beneath each master bar is an electromagnetic head, which detects the exact magnetic center of each projection on the master bar, as the bar passes over the head, and registers a zero reading on an indicating meter.

The basic one-inch spacing is further subdivided by positioning the electromagnetic head between any two projections on the master bar with a high precision micrometer screw. A large 4½" diameter micrometer barrel, with wide spaced graduations, permits easy reading for direct settings to .0001". A separate screw, within the micrometer screw, is used to "zero" the electromagnetic head under the nearest projection on the master bar, when establishing an initial zero position on the workpiece. Cylindrical refer-

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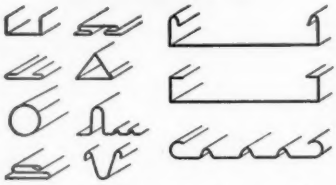
AND ROLLER DIES



Also Pittsburgh Lock Machines, Pipe and Elbow, Beading, Turning Machines and all other Sheet Metal Working Machinery. Your inquiries invited.

Maplewood Machinery Co.
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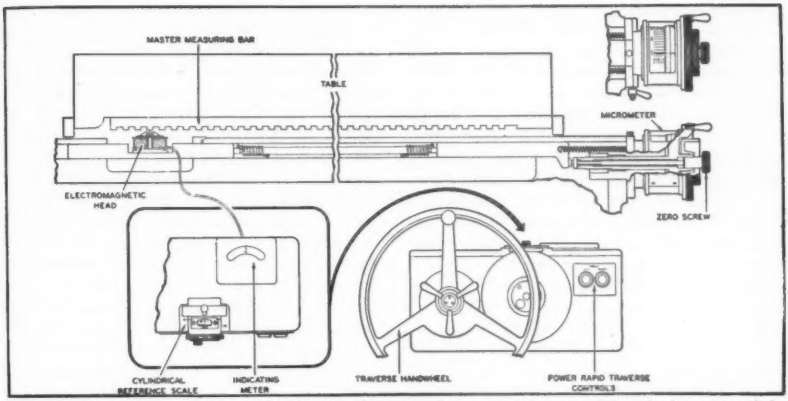


ence scales are used to rapidly locate the table to approximate settings.

To locate a hole, the operator simply sets the micrometer for the inch fraction and operates the power rapid traverse until the reference scale reads the approximate setting. Final adjustment is made by handwheel, the exact setting being accomplished when the indicating meter reads zero.

The traversing screws of the two slides have no connection with the measuring system; therefore errors in the screws, backlash or wear cannot affect the accuracy of the setting. The master measuring bars are sealed in the machine, protected from dirt and chips, and since measuring is accomplished without making physical contact, they are not subject to wear.

PAT. PEND.

TYPE TD

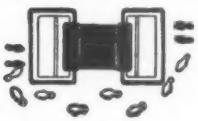
10 TD 10" 14 TD 14"

TWIN WHEEL TOOL GRINDER

(Also single cup wheel)

The World's Most Modern Grinder For Carbide, Stellite, or High Speed Steel Tool's . . . .

HEAVY DUTY, WET OR DRY, 10"-14" WHEELS



OLD WAY

Lost time between rough and finish grind.

Floor space wasted — Grinder must be away from wall.

NEW WAY

One step from rough to finish grind.

Conserve floor space— place Grinder against the wall.

Positively no spray or splash when grinding wet!

WRITE TODAY FOR BULLETIN 18

THE STANDARD ELECTRICAL TOOL CO.

MT. HOPE AND SIXTH STREET CINCINNATI 4, OHIO

SEE ADVERTISERS INDEX, PAGE 103, FOR KEY NUMBERS

. . . Stainless Steel

The use of carbides for milling is recommended only where modern, heavy duty machines are available; then, both increased cutting rates as well as better utilization of power are realized. Usually, a minimum feed of 0.005" is realized; the maximum depending upon both available horsepower and chip disposal. Negative rake angles are employed which tend to direct the cutting force into the cutter body, thus taking advantage of the high compressive strength of the carbide [2]. Cutter replacement and maintenance costs are high, and benefits derived are realized from a volume of work.

Broaching. This method removes metal either internally or externally very rapidly; however, there should be no interference with the movement of the broach. Broaching may perform by means of one tool a roughing cut, a semi-finishing cut and a finishing cut. In some instances, broach tools have burnishing buttons where a burnished finish is required. There are, in general, two types of broaches, the vertical and the horizontal broach; either of which can be used for pull or push broaching. Where internal broaching is done, a properly drilled or reamed hole provides a satisfactory start. On external broaching, preliminary machining operations are seldom required.

In designing the radius for the broach tooth, the manufacturer provides maximum tooth strength and a "pocket" for chips. Other factors included in broach design are side relief for flat broaches, undercut and clearance for spline broaches and chip breakers to handle wide chips. These vary in accordance with specific jobs. On internal broaching, the "backoff" angle should be held to a minimum of 2° and not more than 5°. Too much "backoff" will shorten broach life due to size reduction in resharpening. Broaches should be handled with care since any nicks on the cutting edges of the broach will result in scored work surfaces. Broaching can be performed on stainless steels having hardnesses up to 35 Rockwell C. For anything above this limit, broaching should be done first, after which a heat treatment can fol-

AT YOUR FINGERTIPS

A must for your bench — Horberg Drill Size, Pin Gages. Unlimited time and cost saving advantages in center and location finding, hole or slot gaging.

- Held Accurate to +.0001 −.0000
- Concentric tapered to fit holes .0012 smaller than gage size.
- 1½" in length for easy insertion
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low. To remove any light scale resulting from heat treatment and to correct possible distortions, a special broach known as a "hard gear broach" should be used provided sufficient power is available in the broaching machine.

Reaming. Either the straight fluted rose or spiral fluted reamer is used; the latter being the preferred for the reaming of deep holes. A 30° chamfer is usually recommended for the spiral reamer with the tool mounted on a floating holder to assure centering. It has been recommended [2] that the reamer should remove approximately 0.003" to 0.010" of metal with a 0.003" to 0.0075" feed per revolution. Also, narrow lands and a secondary lead angle of approximately 2 to 3° are advisable.

Due to the work-hardening characteristics of the austenitic stainless, ample metal should be left for reaming so that a continuous bite can be realized. This practice will also protect the reamer from rapid wear and possibly failure. Here again, the use of a good lubricant is emphasized, and in addition, reamers should be handled with care and stored properly.

Skiving. This type of tool is used extensively on either single spindle automatics or on turret lathes for the forming of irregular diameters. This tool can be of flat or dovetail design. A sheer angle of 5° to 15° reduces the cutting pressure as it allows but a small portion of the cutting edge to contact the workpiece at any instant of the stroke. The cutting edge should be ground with a 1° to 2° clearance angle. The skive tool is usually operated at the same speeds and feeds as form tools, removing from 0.005" to 0.010" of metal.

Shaving. The shave tool is employed wherever close tolerance and fine finish are desired. This operation is often incorporated in a multiple spindle sequence of operations; in many cases being combined with the cut-off operations. This tool is very similar to the form tool in that the entire cutting edge contacts the workpiece during operation. The removal of metal in this operation may vary from 0.005" to 0.010".

(To be concluded next month)

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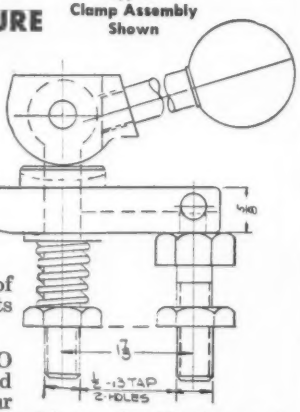

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Helical Inserts Speed Thread Repairs

The maintenance department serving one of New York City's subway lines has the frequent problem of replacing worn and stripped threads in the axle-cap bolt holes of its subway car motor-frame castings. Repair of these holes is expedited by the use of stainless steel helical-wire thread inserts.

These inserts permit the use of the same size cap screws in the repaired holes as were used in the original holes. This eliminates the matching operations that would be necessary if oversize threads and cap screws were used to solve the damaged thread problem. Use of these inserts also eliminates the need for drilling out larger clearance holes in mating parts. In addition, these preformed wire inserts provide threads that are stronger, more wear-resistant, and more corrosion-resistant than the original threads.

Thread repair is accomplished in the following manner; the damaged thread is cleaned out with a drill slightly larger in outside diameter than the major diameter of the original thread; the hole is retapped using an oversize, special-threaded tap; and the helical thread insert is installed.

Threads in the motor frame shown in Figure 1 were repaired in this manner. This casting had a badly worn thread, (A), a completely stripped thread, (B), and a broken 2¼" cap screw, (C). Original holes had 1 9/32-7 tapped threads.

After removal of the broken stud, these three holes were repaired by: (1) drilling out with a 1 21/64-in. drill, (2) tapping with a special oversize Heli-Coil tap identified with a 1 9/32-7 marking, and (3) installing a stainless steel Heli-Coil thread insert, Figure 2, to bring the hole back to size. This insert, having a diamond-shaped cross-section, has threads on its outside diameter conforming to the special tap and internal threads conforming to the original 1 9/32-7 thread.

The entire operation was completed in approximately 55 minutes. The formed wire inserts, Figure 3, provide smooth threads that permit frequent assembly and disassembly operations with a minimum of thread wear. Also, corrosion caused by infiltration of water or other reactive liquids and gases will not cause deterioration of these threads.

The superior strength of the 18-8 stainless steel more than compensates for the loss of material in the bolt-hole boss, (C). Also, increased loading strength is achieved because the helical insert automatically adjusts itself to mating threads on both the casting and the stud, thereby distributing the load uniformly over the threads.

Fig. 1. Worn and damaged threads to be repaired.

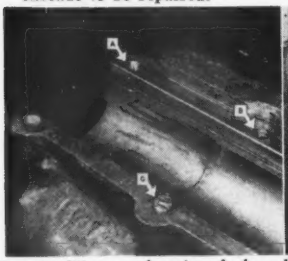

Fig. 2. Special inserting tool installs new thread.

Fig. 3. New thread driven into the retapped hole.

Fig. 1. Worn and stripped threads in the axle-cap bolt holes A, B, and C, of this subway car motor frame casting were replaced with stronger threads of the same size through the installation of stainless steel Heli-Coil thread inserts. Fig. 2. After retapping, hole A was ready to receive its new thread lining. This shows how the operator installs the new thread with a high speed inserting tool. Fig. 3. The newly installed thread insert can be seen in place, half a turn below the surface of the casting. The Heli-Coil replacement to be inserted in hole B is also shown.

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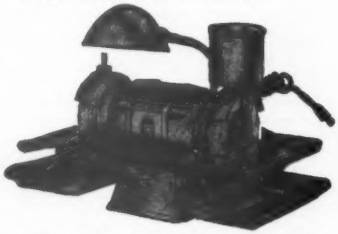

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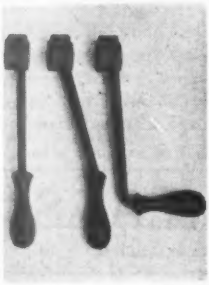

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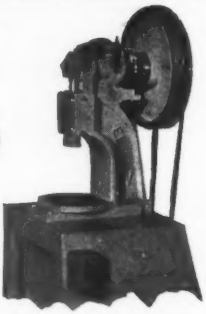

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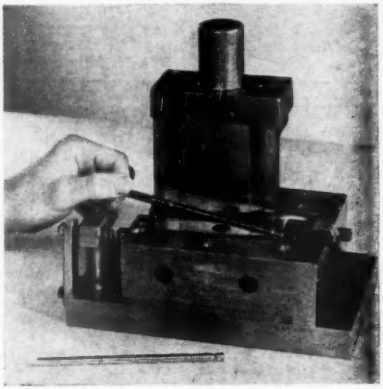
Press Tool for Rolling Spiral Grooves

The illustration below shows a simple rolling fixture, faced with blanks of Carboloy cemented carbide, and used in a #21 Bliss press, which is doing the job of a thread generating machine in the Appliance & Merchandise Department of the General Electric Company.



The operation consists of rolling two spiral grooves .020" deep in .260" diameter fan rotor shafts. The fixture rolls the shaft downward past two blades of Carboloy cemented carbide set at the proper helix angle. It is estimated the Carboloy blades need repolishing only after around 200,000 pieces. High speed blades have also been tried in this operation and a total of 60,000 pieces obtained over the tool life which is representative of ten regrinds.

★ ★ ★

Carpenter Steel to Erect New Hot-Rolling Mill

A new, $3,000,000 hot-rolling mill is to be constructed by The Carpenter Steel Company, Reading, Pa., according to Paul B. Greenawald, vice-president and plant manager. Ground will be broken shortly and the project completed within a year to a year and a half.

The new mill, unlike any now in existence, will be a combination strip, bar and rod mill. Designed and engineered for maximum flexibility, it will incorporate the most modern practices and assure the ultimate in quality control.

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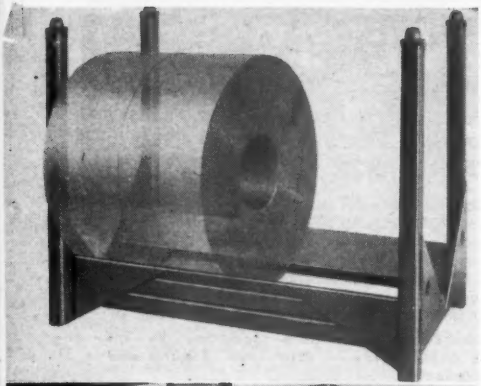
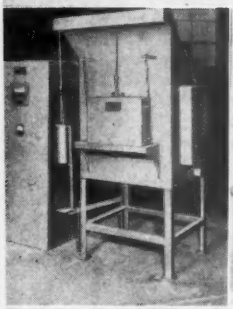
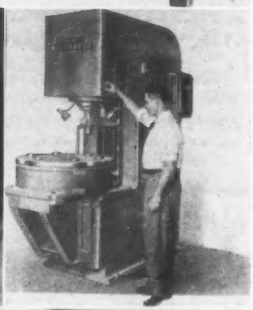
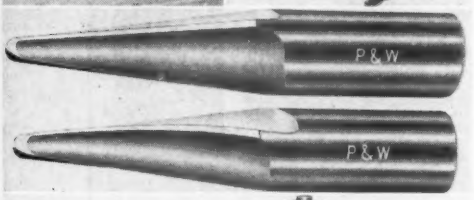
PROGRESS

NEW DEVELOPMENTS • IMPROVEMENTS • COST AND TIME SAVERS









Extra Heavy Duty Coil Racks up to 10,000 lbs. capacity for stacking purposes have been announced by American Sales Engineers, distributors for American Metal Products Co. The racks are of tubular all welded construction, with two heavy square tubes welded together for the extra load capacity. Nesting caps, welded into the tubular corner posts, make for safe, convenient storage in multiple tiers. AMERICAN SALES ENGINEERS, Dept. 89, 141 W. Eight Mile Rd., Detroit 3, Mich.

Circle Inform-A-Gram No. A1.

Pereco "FG" Series Electric Furnaces (outside cut), equipped with Globar heating elements, are designed for heavy, continuous duty at all heat levels up to 2500° F., with higher temperatures available for short or intermittent runs. Each furnace has a separate, matching control panel unit, complete with indicating controller transformer, current input meter with push-button reading, and magnetic contactor. PERENY EQUIPMENT CO., 893 Chambers Rd. and Pereco St., Columbus 12, Ohio.

Circle Inform-A-Gram No. A2.

The New Denison 50-Ton Oil-Hydraulic Multipress (inside cut) offers advantages of fast action with high-tonnage pressures under accurate, regulative control. This press has a 15" stroke, 24" daylight opening, and a work surface of 31" x 19½", all of which provide more die space. Its precision adjustments for multiple ram action give unusual flexibility for varied applications. THE DENISON ENGINEERING CO., 1197 Dublin Rd., Columbus 16, Ohio.

Circle Inform-A-Gram No. A3.

P&W Taper Die Sinking Cutters are now being supplied in two types, both with full-cutting ball nose finish-ground to cut to dead center, so that no preliminary hand grinding is necessary. Straight-fluted cutters are available for easy hand sharpening; spiral, for users who prefer helical cutting characteristics and have mechanical grinding equipment. PRATT & WHITNEY, Div. Niles-Bement-Pond Co., W. Hartford 1, Conn.

Circle Inform-A-Gram No. A4.

An Air-Operated Zinc Die Casting Machine, with completely automatic cycling and adjustable timing dwell on opening and closing of toggle and injection of molten metal, has been introduced. It will produce castings up to 1 lb. capacity and is capable of a free cycling speed beyond 1000 shots per hour. A.B.C. DIE CASTING CO., Dept. T, 339-41 W. 112th Place, Chicago 28, Ill., will provide more details.

Circle Inform-A-Gram No. A5.

ON PARADE

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Solid Carbide Standard Boring Tools are the latest addition to the Super Tool line. Nine types of carbide boring tools are now offered. They are available from stock in all the carbide grades listed in the company's Catalog No. 50, and can be produced in other suitable grades, if desired. There is a standard type to fit each of the more popular boring machines. SUPER TOOL CO., 21650 Hoover Rd., Detroit 13, Mich.

Circle Inform-A-Gram No. A6.

Wallace No. 800 Hydraulic Bender is a small, compact pipe and tube bending machine 21" wide x 34" high x 78" long for space saving, but with power well beyond its capacity of 1¼" OD x No. 16 B.W.G. steel tubing. The unit, operated by a single lever, is powered by a standard 2 hp, 220/440 v, 3-phase, 60 cycle motor. The bending die is held on by spring clips, for easy changing. WALLACE SUPPLIES MFG. CO., 1300 Diversey Pkwy., Chicago 14, Ill.

Circle Inform-A-Gram No. A7.

A New Periphery Press Holder (inside cut) has been developed by M. E. Cunningham Co. for marking the outer circumference of small diameter parts. This new Model PPH-10 holder is custom made for each job, with the radius, size and number of characters determined by the piece to be stamped. It is made with shank size to fit any press and is designed to use regular straight-sided type. M. E. CUNNINGHAM CO., 104 E. Carson St., Pittsburgh 19, Pa.

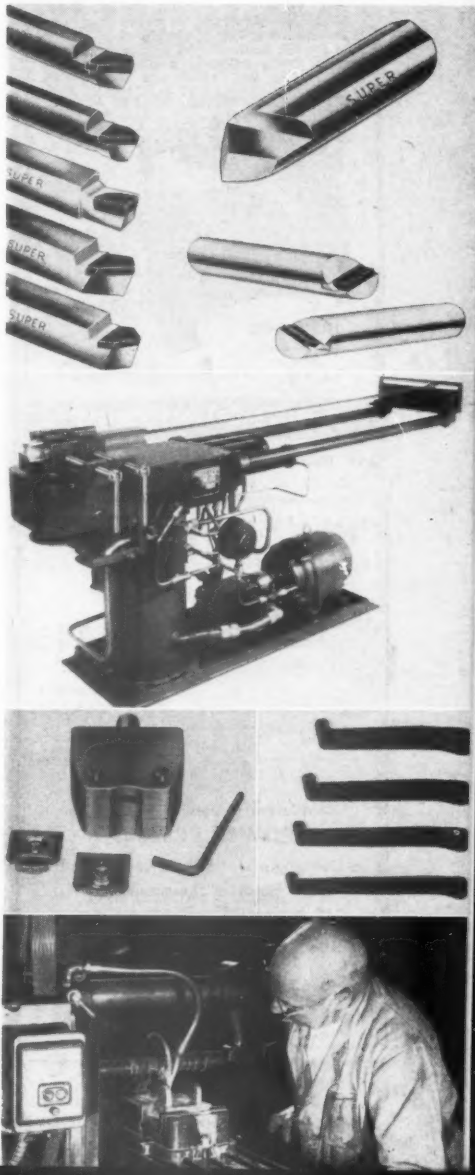
Circle Inform-A-Gram No. A8.

A Standardized Line of Trigger Stops (outside cut) for progressive dies is now offered by Reid Tool Supply Co. Made of cold finished steel and black penetrate finished, they are available in 3½", 4", 4½" and 5" lengths. The body is 5/16" square; the stop end has a 5/32" radius and is ⅝" long. The finger end is forged flat. These stops are not hardened and can be readily drilled in the location desired for installation in the die. REID TOOL SUPPLY CO., 709 Baker St., Muskegon Heights, Mich.

Circle Inform-A-Gram No. A9.

Fauver "Bullseye" Coolant Spouts stay put without any support and are adjustable to any position by the touch of the hand. They feature: elimination of all leaky pipe joints and swivels; unrestricted flow of coolant; a clear, unobstructed view of the work; ease of switching from one machine to another; and long life. J. N. FAUVER CO., INC., Dept. TD, 49 W. Hancock, Detroit 1, Mich., will provide more data.

Circle Inform-A-Gram No. A10.



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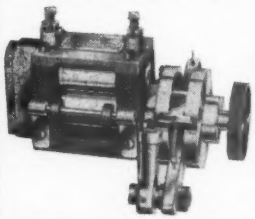

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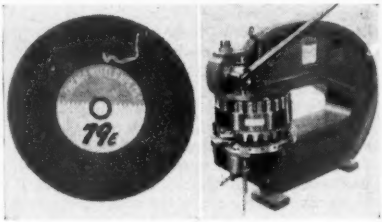
PROGRESS ON PARADE

A New Vitrified Bond (below) will provide grinding- and mounted-wheel users a 5-10% boost in grinding and finishing output. Called "79E," this new Chicago Wheel bond is recommended for portable grinding of billets, brake drums, steel castings, centers, stainless steel welds, etc. It assures a smoother, faster cutting action for vitrified grinding wheels operated at speeds up to 6000 sfm. Longer production time per wheel is also provided, with lowered down-time for change-over or wheel dressing afforded. CHICAGO WHEEL & MFG. CO., 1101 W. Monroe St., Chicago 7, Ill.

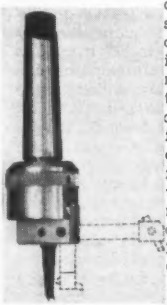
Circle Inform-A-Gram No. A11.



Rotex Model 18B Punch Press (above) has a 24" throat and is designed to handle sheet material up to 48" wide. The rotary turret permits locating any one of 18 desired punch sizes almost instantly. The turret rotates to the wanted punch size, locks in position automatically. No time is lost in setting up; the machine is always ready to operate. Eighteen punch stations can be furnished on the standard turret in 5/64" to 2" sizes and these operate efficiently on sheet metal, plastic, cardboard or fibreboard up to 10 gauge thickness. ROTEX PUNCH CO., 4726 E. 12th St., Oakland, Calif.

Circle Inform-A-Gram No. A12.

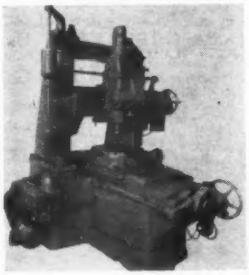
E-Z Set Boring Tools have been improved by The Maxwell Co. to facilitate setup, increase accuracy and assure maximum ease of operation. Improvements include: increased tool rigidity through incorporation of larger dovetail areas; ground fit male and female dovetail; micrometer-like adjustment that facilitates accuracy to within .0002"; and elimination of distorting slots or gibs. THE MAXWELL CO., 225 Broadway, Bedford, Ohio, will furnish more data.



Inform-A-Gram No. A13.

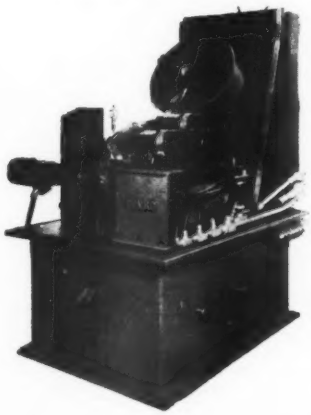
PROGRESS ON PARADE

Hauser Type 5 Jig Borer is designed for maximum rigidity without excessive weight, the entire unit weighing just 7000 lbs. All lead screws are precision ground from special stabilized steel, then optically checked for



minor pitch errors which are compensated for by corrector bars. Guaranteed accuracy of slide locations is .0002" and settings are read to .0001" on vernier scales. HAUSER MACHINE TOOL CO., 30 Park Ave., Manhasset, N. Y.
Circle Inform-A-Gram No. A14.

Speeding Up the Drilling and countersinking of cotter pin holes in clevis pins and screws is accomplished with a new Govro-Nelson machine. It turns out 1500 pieces per hour. It is fully automatic, employing four Model KH Govro-Nelson Automatic Drilling Units, a



Geneva type, 8-station indexing dial and a hopper part-feeding mechanism. GOVRO-NELSON Co., 1933 Antoinette, Detroit 8, Mich.
Circle Inform-A-Gram No. A15.

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FURNACES FOR INDUSTRY

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BARGAINS!
LONG DRILLS

9" Flute
12" High Speed 12"

Size	Price Each
1/8"x12"	$2.06
9/64"x12"	2.06
5/32"x12"	2.06
11/64"x12"	2.06
3/16"x12"	2.06
13/64"x12"	2.19
7/32"x12"	2.19
15/64"x12"	2.40
1/4"x12"	2.40
17/64"x12"	2.55
9/32"x12"	2.55
19/64"x12"	2.75
5/16"x12"	2.75
21/64"x12"	3.11
11/32"x12"	3.11
23/64"x12"	3.46
3/8"x12"	3.46
25/64"x12"	3.81
13/32"x12"	3.81
27/64"x12"	4.17
7/16"x12"	4.17
29/64"x12"	4.52
15/32"x12"	4.52
31/64"x12"	4.52
1/2"x12"	4.52

DIAMONDS

BARGAIN PRICES

KNOWN FOR THEIR PRECISION AND DEPENDABILITY.

SAVE WITH EASTERN

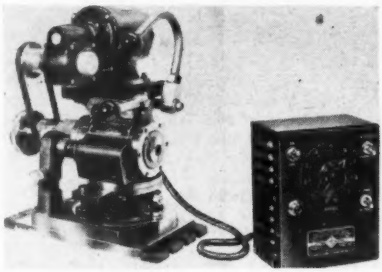
Dress your wheels accurately with long lasting diamonds. 7/16" x 6" shank furnished if not specified.

Carat	Price Complete
¼	$4.50
½	6.00
¾	10.50
1	13.50
1½	18.00
2	22.50
3	37.50
4	52.50

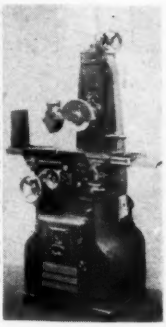
Send for Free Catalog, 128 pp.

EASTERN TOOL SUPPLY CO.
176 Grand St., N.Y., N.Y.

With the Lindly "Step-Up" Scale (below), enlarged drawings of small objects in ratios of 1:1, 2:1, 3:1, 4:1, 5:1, 8:1 and multiples of ten can be quickly made without the usual longhand multiplication and 1:1 scale. Use of this scale has shown time savings up to 30%. The scale is calibrated in decimal parts of an inch (not fractions). LINDLY & CO., 80 Herricks Rd., Mineola, L. I., N. Y.
Circle Inform-A-Gram No. A16.



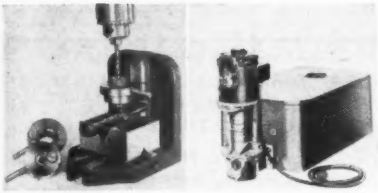
The Latest D-S Radial Relief Grinder (above) is a motorized fixture featuring stepless speed control. This is achieved with a selenium rectifier that makes possible speeds from 0 to 80 rpm by a turn of the dial knob. The motor is a dc, 110-v, gear reduction type. This fixture, which can be used with a number of standard tool grinders, is offered with or without the D-S stand and grinder. D-S GRINDER DIV. of ROYAL OAK TOOL & MACHINE CO., 623 E. Fourth St., Royal Oak, Mich.
Circle Inform-A-Gram No. A17.



Modern No. 2 Surface Grinder, with an 18" x 6" table, has large capacity between wheel and table, and is fitted with a Boneham & Turner Interchangeable Spindle. This allows large parts to be ground when using a magnetic chuck, without reducing the diameter of the grinding wheel, and considerably cuts production time. DCMT SALES CORP., 164 Duane St., New York 13, N. Y.
Inform-A-Gram No. A18.

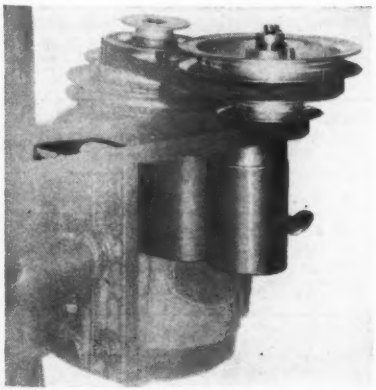
PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION

The Mathewson Adjustable Drill Jig (below) can cut layout and drilling time when used for drilling holes through round stock ¼" to 2", and hex stock and cap screws from ¼" to 1". The hardened V-Block has a 90° V for round stock on one face, and a 60° V for hex stock and cap screws on the opposite face. MATHEWSON MACHINE WORKS, INC., 2 Hancock St., N. Quincy 71, Mass.
Circle Inform-A-Gram No. A19.

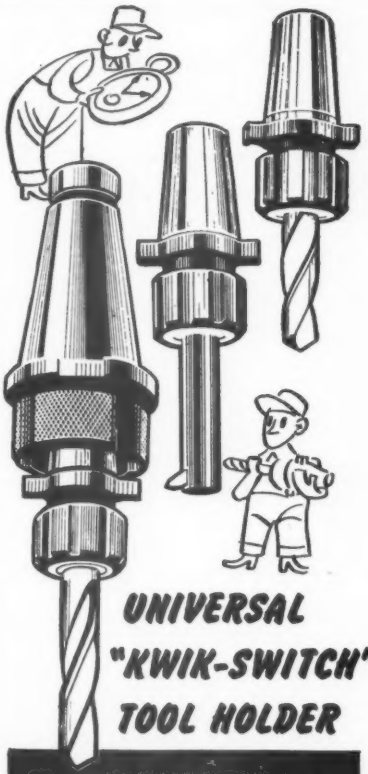


Delta-Milwaukee Coolant Equipment (above) consists of a coolant pump and a tank which are highly adaptable and can be used on most wet machine tools. A single unit meets the needs of a multiple-spindle drill press up to eight spindles. DELTA POWER TOOL DIV., Rockwell Mfg. Co., 600 E. Vienna Ave., Milwaukee 1, Wis.
Circle Inform-A-Gram No. A20.

The Newman Speed Reducer is a new attachment for power driven tools, such as drill presses, providing change of speed and multiple power take-off without interfering with such tools. It reduces speed from 1725 rpm to as low as 240 rpm, and fits all standard motor bases of ¼, ½, ¾ hp. NEWMAN



MACHINERY CO., 8-10 Stearns Square, Springfield, Mass.
Circle Inform-A-Gram No. A21.



SEE ADVERTISERS INDEX, PAGE 103, FOR KEY NUMBERS

CONTRACT TOOLING AND PRODUCTION

Illinois

DRESEL-BETZ CO.
Belleville, Ill.
Designers and Manufacturers of Tools, Dies, Jigs, Fixtures, Metal Stampings.

Michigan

DAVIS TOOL AND ENGINEERING CO.
19250 Plymouth Road, Detroit, Michigan, VErmont 5-6000. Tools and Dies, Special Machinery. Sheet Metal Stampings and Assemblies.

New York

AMERICAN MEASURING INSTRUMENTS CORP.
240 West 40th St., New York 18, N. Y. Jigs fixtures, gages, dies, precision parts.

CONRAD & MOSER
2-23 Borden Ave., Long Island City, N. Y. Machine Tools & Molds, Parts & Machines Aluminum Cast Parts, Aluminum Sheet Formed Housings.

Ohio

CLEVELAND UNIVERSAL JIG COMPANY
13404 St. Clair Ave., Cleveland, O., MUlberry 2600
DESIGNERS AND BUILDERS
Jigs and Fixtures Special Machines
Production Engineering
Complete Plant Routing and Tooling

THE DENNING MANUFACTURING CO.
2024 E. 70th St., Cleveland, O., EX. 4900 Designers and Builders of High Grade Dies.

GENERAL DIE & TOOL CO.
2067 W. 55th St., Cleveland, O., WOodbine 4736. Dies, Tools, Jigs, Fixtures, Light Stampings, Special Machinery Manufacturing.

H & P DIE & STAMPING CO.
13947 Triskett Rd. Cleveland 11, Ohio
PRECISION DIES, JIGS & FIXTURES
Quality Stampings
Bus & Trailer Parts

THE INDUSTRIAL MACHINE CO.
1436 East 47th St., Cleveland, O. Founded in 1908. Builders of Special Machinery. General Machine Work.

KIFFER TOOL & DIE CO.
5601 Tillman Avenue, Cleveland, Ohio, WOodbine 2440-2441. Manufacturers of Special Machinery, Tools, Dies, Jigs, Fixtures, Swiss Jig Boring.

NOBLE & STANTON, INC.
998 Broadway, Bedford, Ohio, Bedford 1234. Tool Makers—Short Run Production Work.

PARAMOUNT TOOL CO.
1392-98 East 43rd St., Cleveland, O., ENdicott 2220. Jigs, Fixtures, Dies, Experimental Work.

THE PHOENIX MACHINE CO.
2711 Church Ave., Cleveland, O., CHerry 1048 Contract Grinding, Boring and Planing. Lester-Phoenix Die Casting and Plastic Molding Machines.

A. P. SCHRANER & CO.
3338 Payne Ave., Cleveland, O., HEnderson 8644. External Cylindrical Lapping Machines, Special Machinery, Tools, Dies, Jigs, Fixtures.

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Precision Die Made—Lowest Possible Cost
DAYTON ROGERS MFG. CO., Minneapolis 7, Minn

HARDNESS TESTING

has been done with the
SCLEROSCOPE
since 1907

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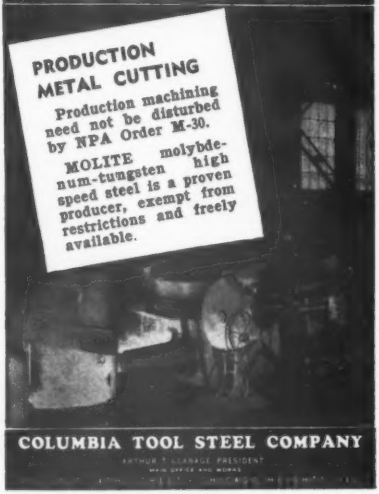
THE SHORE INSTRUMENT & MFG. CO., INC.
9025 Van Wyck Avenue
Jamaica 2, N. Y.

Columbia TOOL STEEL


PRODUCTION
METAL CUTTING
Production machining need not be disturbed by NPA Order M-30.
MOLITE molybdenum-tungsten high speed steel is a proven producer, exempt from restrictions and freely available.

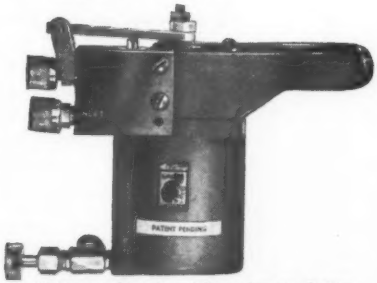
COLUMBIA TOOL STEEL COMPANY

DOUBLE YOUR DRILL PRESS OUTPUT FOR $33

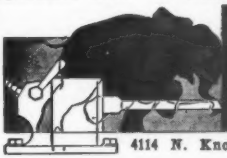
Use a New Mead Pneumatic Drill Press Feed for Drilling, Reaming, Tapping

This simple, inexpensive device quickly converts standard drill presses into semi-automatic machines—increases production substantially on suitable jobs: double or more in some cases.

Clamps to spindle quill in a few seconds. Automatically closes air fixture on work. Adjustable feed control and breakthrough cushion. Quick return. Easy to synchronize with automatic cycle equipment.



Air-Power does it quicker, cleaner, better. Write today for latest complete catalog.



MEAD
SPECIALTIES COMPANY
4114 N. Knox Ave., Dept. HA-31, Chicago 41, Ill.

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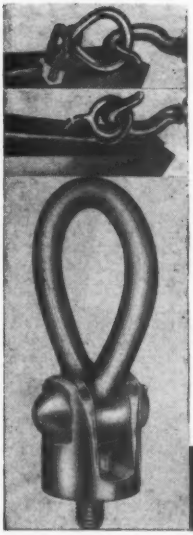

SPEED SAFETY, ECONOMY

IN YOUR SHOP LIFTING — USE . . .

Schaffer { **LOAD CENTERING EYE BOLTS**

NOT A MERE EYE BOLT — BUT A NECESSARY TOOL

Has a perfect self load centering action which provides true alignment of load. Eliminates bolt thread straining and breaking off.

- provides greater safety for your men and saves valuable time.
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- Built to last a lifetime.
- Made of high grade steel . . . whose ductility and toughness is greater than ordinary Commercial Steel . . . therefore, Schaffer Eye Bolts can be subjected to heavy intermittent jerks and strains.
- Thousands in use in all industries.

STOCK ITEMS

½" to 5/8"—$11.75 each,
¾"—$13.50 each,
⅞" to 1"—$23.50 each

Specials on quotation.
When ordering specify amount and bolt thread size.

S. S. SCHAFFER CO.
1846 E. 57th ST. LOS ANGELES 58, CAL.

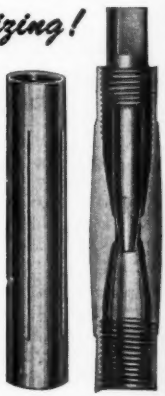
Flexolap... INSTANTLY AND ACCURATELY

ADJUSTABLE FOR FAST CUTTING AND POLISHING

...without danger of galling or seizing!

The Flexolap barrel is made with a series of longitudinal slots milled "off-center" to permit sensitively flexible expansion up to 15% — or more — under pressure of the adjusting pin. This construction enables Flexolap to save valuable time and to lap rounder, straighter holes. For accurate precision take-up, as desired, to maintain size and compensate for wear on barrel . . . simply turn adjustment screw.

Illustrated at left is Set No. 1. Six sizes (3/16", 1/4", 5/16", 3/8", 7/16" and 1/2") with six brass and six steel barrels on wood stand, complete.....**$12.75**



Also available in sizes 7/32", 9/32", 11/32", 13/32", 15/32", 9/16", 5/8", 11/16" and 3/4". For lapping holes smaller than 3/16", use the *Midget Lap*. Seventeen sizes: .032, .036, .040, .046, .054, .062, .070, .079, .090, .104, .120, .135, .155, .170, .187, .218, and .250. Trial assortment (17 laps).....$1.95

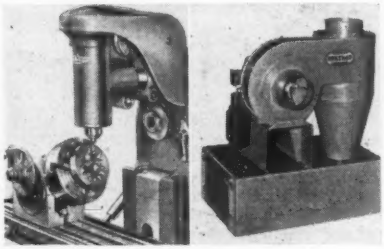
Write today for complete particulars

FEDERAL TOOL CORP. 3600 Pratt Blvd., Chicago 45, U.S.A.

PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION

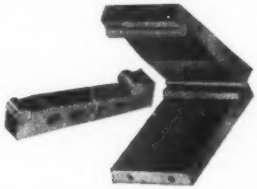
PROGRESS ON PARADE

An Improved Vertical Mill Attachment (below), retaining all the high performance features of the original design, has been introduced by Marvin Machine Products, Inc. This streamlined model offers precision and ruggedness of construction. Safety for the operator is provided by a protecting hood over power transmission parts. Complete details on this versatile attachment may be obtained from MARVIN MACHINE PRODUCTS, INC., 414 Ford Bldg., Detroit 26, Mich.
Circle Inform-A-Gram No. A22.

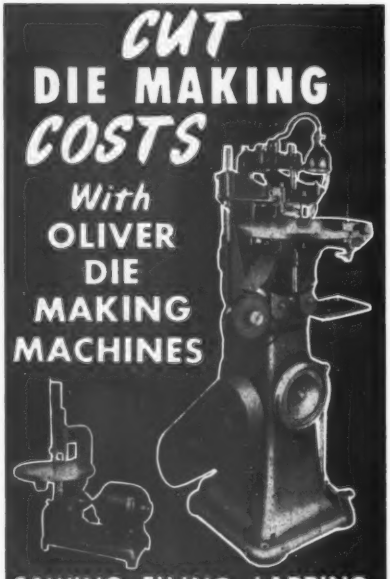


Model 8N50 DUSTKOP Dust Collector (above) is a new filterless unit made by Aget-Detroit Co. and rated at 885 cfm with 3" static suction. It is recommended especially where outside exhaust of cleaned air is required due to state regulations or the presence of toxic fumes or vapors. Features of the unit are portability, immediate installation and compactness (20" x 30" floor space). Write for more information to AGET-DETROIT CO., 213 Main St., Ann Arbor, Mich.
Circle Inform-A-Gram No. A23.

Sine Plates and Sine Bars are being marketed by Brand Tool & Supply Co. These sine plates and sine bars are made of high grade alloy steel, properly heat treated and finish ground. Sine plates have holes drilled and tapped in the upper plate for clamping



of work to be checked or machined. Sine bars are used either for measuring angles accurately or for locating work to a given angle within very close limits. BRAND TOOL & SUPPLY CO., 907 S. Victory Blvd., Burbank, Calif.
Circle Inform-A-Gram No. A24.



Now, more than ever, you need to bring your toolroom up-to-date. Do it with OLIVER DIE MAKING MACHINES—They'll speed up your production — reduce your costs — and produce more accurate dies. Many OLIVER DIE MAKING MACHINES have been in continuous use for over 25 years and OLIVER Users report savings up to 60% because they are extremely fast and accurate on all Sawing, Filing and Lapping operations. Modernize your Die Making Methods the *cost cutting* OLIVER WAY.

Oliver Die Makers available in 5 models —

The Bench Model S-1 (illustrated) is a single speed die maker for use on tool steel up to 1" thick.

The Heavy Duty Model (illustrated) has 6 speeds, works in metal up to 3" thick, has variable strokes to 5" plus hydraulic feed.

Write today for complete technical data on Oliver Die Makers

OLIVER INSTRUMENT CO.
1436 E. MAUMEE • ADRIAN, MICHIGAN

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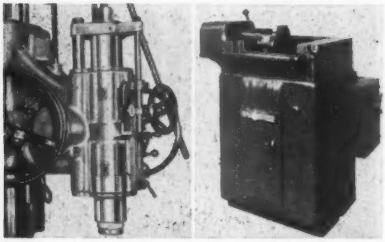
PROGRESS ON PARADE



A New Ball Roll Quill Mounting is an exclusive feature on P&W Jig Borers Nos. 2A and 3B. Above is a phantom view of the spindle head showing the construction of this new quill mounting. Two hardened and ground steel liners are deep frozen, set in the head casting, and then precision lapped in place. The spindle quill, draw polished to extreme accuracy, "roll feeds" on 240 specially selected precision balls, all preloaded, giving a total bearing pressure of 6000 lbs. between the quill and hardened liners. Chief advantage is the elimination of frequent maintenance. PRATT & WHITNEY, Div. Niles-Bement-Pond Co., W. Hartford 1, Conn.
Circle Inform-A-Gram No. A25.

A Rapid-Action Red Ring Gear Tester (left) is used to test automatic transmission low planet pinions for nicks by running them in mesh with a master gear. A power spindle, on which is mounted the master gear, drives the work pinion which is merely slipped onto its spindle in the rocking workhead; no retaining work fastener is needed. This machine affords the operator full protection. NATIONAL BROACH & MACHINE CO., 5600 St. Jean Ave., Detroit 13, Mich.
Inform-A-Gram No. A26.

The Micro-Fog Lubricator of C. A. Norgren Co. develops a true fog in which extremely minute and uniform size particles of lubricant remain in suspension in the air stream. Advantages include: fog can be carried to far greater distances than that developed in conventional lubricators; it can be uniformly distributed through several outlets; effects more thorough lubrication. C. A. NORGREN CO., 222 Santa Fe Drive, Denver 9, Colo.
Inform-A-Gram No. A27.

For PRECISION FINISHES on CARBIDE, TOOLS, DIES, Etc.
and
MIRROR FINISHES
. . . in minutes instead of hours
"MICRO MESH"
PURE DIAMOND LAPPING COMPOUND
WILL SOLVE YOUR
LAPPING
PROBLEMS
write for details
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Remove burrs!
Chamfer holes!
NOBUR TOOLS
Industry's unmatched tool for
FAST, COST-REDUCING PRODUCTION
WRITE TODAY
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EISLER JIG BORING
CAM MILLING
A SPECIALIZED ROWBOTTOM CAM MILLING SERVICE . . . JIG BORING . . . SPOT WELDING . . . CONTRACT PRODUCTION . . . EXPERIMENTAL DEVELOPMENT
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732 S. 13th Street (Avon Ave.)
Newark, N. J.

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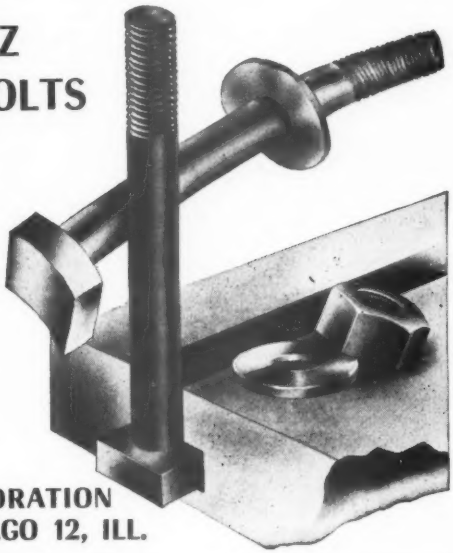
BOYAR-SCHULTZ
SMB MACHINE BOLTS



Every mechanic knows the damage done to the accuracy of costly machine tools by using soft, poorly made or distorted bolts on T-slots of machine beds.

Boyar - Schultz SMB. Bolts are made from upset forgings of alloy steel, heat treated for maximum properties. They are precision machined, heads at right angle to body presenting a flat bearing surface to T-slots.

SMB Bolts, Nuts & Washers Immediately Available From Stock.

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2112 WALNUT ST., CHICAGO 12, ILL.

People work better when they SEE BETTER

MAGNI-FOCUSER's matched prismatic lenses give needle-sharp magnification. Comfortably light weight. Fits over regular glasses. Leaves both hands free. Normal vision resumed by lifting head.

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SPEEDS PRODUCTION

Precision workers do the job faster and more accurately with a Magni-Focuser—the proven binocular magnifier.

Gauge reading, layout work, inspection, tool and die work are just a few of the jobs that need the Magni-Focuser. Speeds precision assemblies, blue print work. Restores the usefulness of the skilled hands of many older workers whose vision needs a seeing aid.

Now aiding thousands of workers, the Magni-Focuser can help your plant produce better. Immediate delivery. 10-day trial without obligation. Return to us if not satisfied. $10.50.

Send for descriptive folder

EDROY PRODUCTS CO. 480 Lexington Ave., Dept. 15, New York 17, N. Y.

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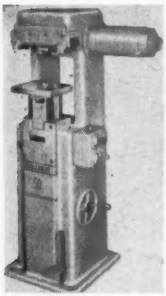
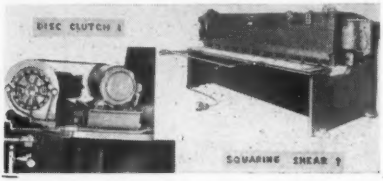
PROGRESS ON PARADE



Three Marking Machines make up the new Noblewest 50 Series. They are the all-pneumatic Model 50P1 (illustrated), semi-pneumatic Model 50P and hand-operated Model 50. All these general-purpose machines use the "roll-marking" process for trouble-free marking and life-long impressions on flat or round surfaces. Model 50P1 will mark up to 1200 pieces per hour. Complete information on this new line may be had from NOBLE & WESTBROOK MFG. CO., Dept. TDJ, East Hartford, Conn.
Circle Inform-A-Gram No. A28.

Columbia's New Series Power Squaring Shears feature an air-operated disc clutch installed in the flywheel and controlled by a solenoid through a jog switch or foot switch. Design is such as to greatly reduce gear wear. Other features include: a powerful, spring-operated disc brake; counterbalanced rams; extremely quiet, vibration-free worm gear drive; and positive, automatic hydraulic hold-downs. COLUMBIA MACHINERY & ENGINEERING CORP., Dept. TDJ, Hamilton, Ohio.
Circle Inform-A-Gram No. A29.



A New Boots Plate-Lok Floating Anchor Assembly incorporates the fully accepted Plate-Lok nut in light, compact, floating anchor base. Bases are available in a variety of styles to suit the method of attachment that is to be used. Sufficient float is provided to compensate for small discrepancies in hole position, etc. Nuts are made of steel in sizes 8-32, 10-32 and ¼-28. The locking section is formed by depressing six threaded flanges inward and downward, so that they exert positive pressure against the body of the bolt. BOOTS AIRCRAFT NUT CORP., Dept. TDJ, Stamford, Conn.
Circle Inform-A-Gram No. A30.

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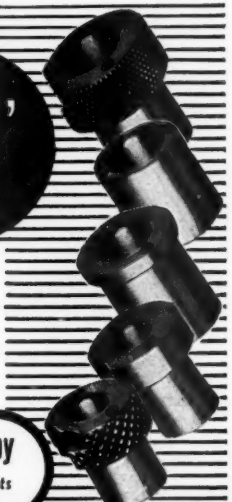
"SPECIAL BUSHINGS"
May Be Our Regular
STOCK ITEMS!

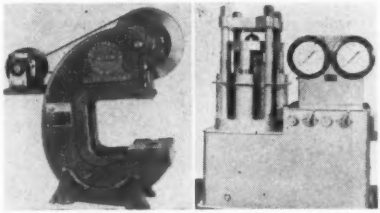
Ready for Immediate Delivery
TWO complete bushing standards, the A.S.A. Standard plus our own Acme Standard, enables you to obtain bushings from stock that might otherwise require special manufacture. Results in faster delivery, lower cost. Write for catalog.



Accurate Interchangeable Concentric
Acme Industrial Company
Makers of Hardened and Ground Precision Parts
206 N. Laflin Street — Chicago 7, Illinois
THE SERVICE SHOP TO INDUSTRY FOR MORE THAN 25 YEARS

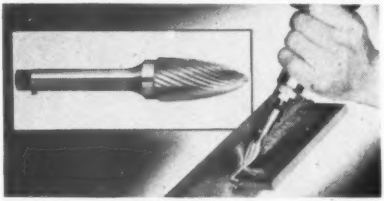
PLEASE USE INFORM-A-GRAM FOR PRODUCT INFORMATION

The Benchmaster 4-Ton Deep Throat Punch Press (below) has been redesigned so as to incorporate several important improvements. Where open height, ram up, was formerly 6¾", the improved model possesses a full 8", permitting use of higher dies and special tooling. The improved press punches to a center of an 18" circle. Frame construction has been strengthened at all stress points and a knock-out has been added. BENCHMASTER MFG. CO., 2952 W. Pico Blvd., Los Angeles, Calif. **Circle Inform-A-Gram No. A31.**



A New Ductility Testing Machine (above) provides a total capacity of a quarter of a million pounds pressure and incorporates a unique 5" diameter penetrator. The unit detects surface and sub-surface imperfections in deep-drawing steel over a comparatively large area. The machine is motorized, hydraulically operated, and provides separate controls for clamping the sample and for regulating the penetrating pressure. STEEL CITY TESTING MACHINES, INC., 8841 Livernois, Detroit 4, Mich. **Circle Inform-A-Gram No. A32.**

A New Ford Rotary Carbide Cutter finishes stainless steel welds quickly, economically



and effectively. This tool was job-engineered specifically for stainless steel and its new flute design permits finishing stainless parts in half the former time. Tool life is increased 400-800%. More detailed information will be provided by M. A. FORD MFG. CO., INC., 732 W. River Rd., Davenport 11, Iowa. **Circle Inform-A-Gram No. A33.**

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Sorry Jobbers: At present, steel situation makes it impossible for us to stock you.

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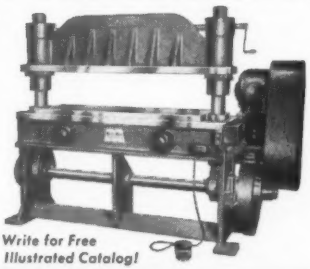

DIAMOND MACHINE TOOL COMPANY
3425 E. OLYMPIC BLVD., LOS ANGELES 23, CALIF.

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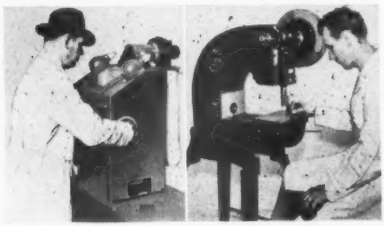
SEE ADVERTISERS INDEX, PAGE 103, FOR KEY NUMBERS

PROGRESS ON PARADE

A New Handy Sandblast Cabinet (below) for cleaning dies, tools, pistons, valves and other small parts has been brought out by The W. W. Sly Mfg. Co. It includes two light fixtures for illuminating the interior, an exhaust fan and a dust bag. Soft abrasives can be used for thoroughly removing all surface impurities without scoring the metal. THE W. W. SLY MFG. CO., 4700 Train Ave., Cleveland 2, Ohio.

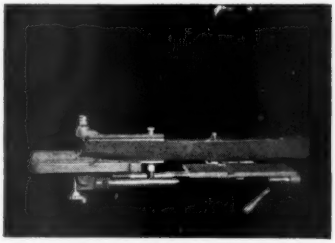
Circle Inform-A-Gram No. A34.



The Kenco 4-in-1 Four-Ton Punch Press (above) features a deep,, 12¾" throat, a sturdy 400 lb. cast frame and patented clutch drive dog built into the clutch collar instead of a slot in the crankshaft. This eliminates weakening of the one-piece shaft by deep milling. A special patented trip mechanism permits changing from single to continuous ramming without stopping the press. KENCO MFG. CO., 5211 Anaheim-Telegraph Rd., Los Angeles, Dept. B, 5211 Anaheim-Telegraph Rd., Los Angeles, Calif.

Circle Inform-A-Gram No. A35.

The Grant Contour Grinder can be easily mounted on any drill press column. It is a simple belt device for complex grinding of concave, convex parts and radii, for deburring, shaping, etc. Change of belt ratio or spindle provides speed ranges from 7000-36,000 rpm. A special interchangeable spindle



attachment provides continuous roll form or cylindrical grinding. GEORGE F. GRANT, INC., 26 Kempton Place, W. Newton, Mass.

Circle Inform-A-Gram No. A36.

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Offered in taper shank single end, and straight shank single and double end; square, round and conical nose patterns. Write for Bulletin C-10.

Illustrated actual size; taper shank, single flute, conical nose cutter.

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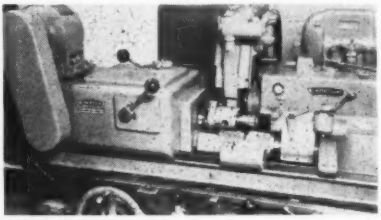
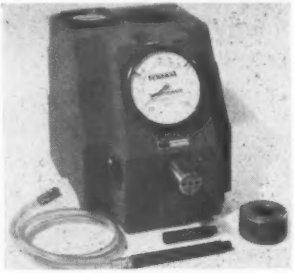
A New Norton Unit for grinding automotive or other types of pistons where a taper to the conventional relief form is required is announced. It grinds the desired shape by holding the piston between centers, with the head end of the piston being carried in a dog, and centered on the master cam spindle center. The bottom end of the piston is supported on a special footstock center carrying a spherical ball bearing. The footstock in which this special center seats does not rock by reason of being mounted on the rocking



bar as in normal cam or shape grinding practice. Get Catalog 1839-1 from NORTON CO., 1 New Bond St., Worcester 6, Mass.
Circle Inform-A-Gram No. A37.

The Federal Dimensionair is a new dimensional air gage with a .003" range that enables the user to determine the size of a hole before he reaches the ultimate size required. Irregular and tapered holes are more easily



gaged. Stability is an outstanding feature, and setting the gage is a matter of seconds. The indicator hand moves quickly and positively to position. Any air pressure between 40 and 100 lbs. can be used. Normal fluctuations in pressure do not affect its accuracy. FEDERAL PRODUCTS CORP., 1144 Eddy St., Providence 1, R. I.
Circle Inform-A-Gram No. A38.

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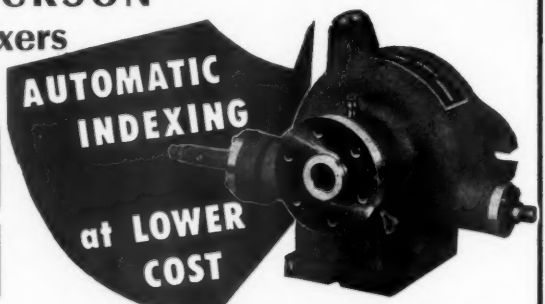

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by 2 DUMORE DRILL HEADS

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